March, 1958

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INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

The Shop Teachers' Professional Magazine

SCHOOL SHOP ANNUAL

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Long before a spade is turned on any construction job, much of the project has been completed. Weeks, months and even years of surveying, planning and design must be accomplished before actual construction can begin. Wherever men move mountains, mountains of rock, mountains of details or mountains of production problems, engineering genius has paved the way.

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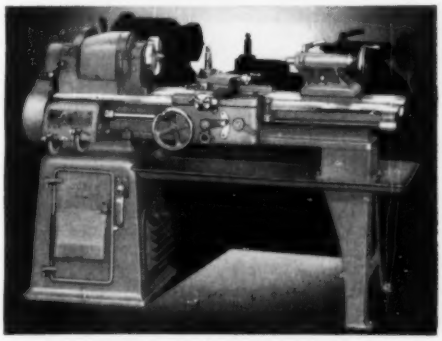

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MARCH
1958

VOL. 47 NO. 3

Industrial Arts and Vocational Education

The Shop Teachers' Professional Magazine

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This Month's Cover

The cover picture on this issue shows a demonstration given in the automechanics shop at the Herbert Hoover High School, San Diego, Calif., by the instructor, John D. Ehrenborg.

Photograph credited to San Diego City Schools.

★ ★ ★

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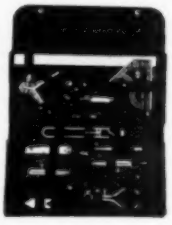

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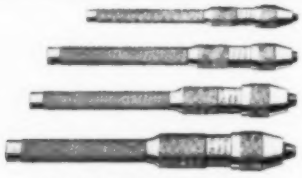

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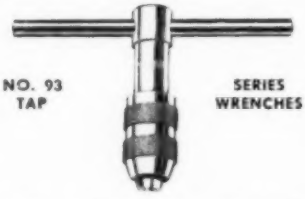

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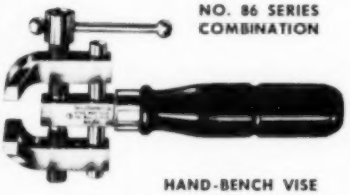

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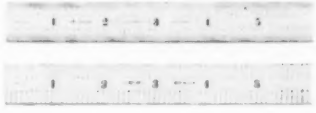

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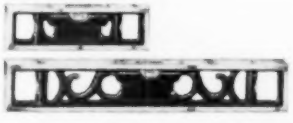

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Association News

COMING CONVENTIONS

Feb. 27–Mar. 1. Illinois Vocational Association, at Jefferson-Sheraton Hotel, St. Louis, Mo. Secretary, Orlin D. Trapp, Township High School, Waukegan, Ill.

Mar. 13–15. New Jersey Vocational and Arts Association, at Hotel Berkeley Carteret, Asbury Park, N. J. Secretary, Jack Shifrin, 72 Madison Ave., Perth Amboy, N. J.

Mar. 14–15. California Industrial Education Association, at LaFayette Hotel, Long Beach, Calif. Secretary, Lee Bodkin, 131 Moore Hall, University of California, Los Angeles 24, Calif.

Mar. 27–28. Alabama Vocational Association, at Birmingham, Ala. Secretary, H. R. Culver, 105 Thach Hall, Auburn, Ala.

Mar. 27–28. Ohio Industrial Arts Association, at Neil House Hotel, Columbus, Ohio. Secretary, C. R. Hawes, 629 Sweitzer St., Greenville, Ohio.

Mar. 27–29. Indiana Industrial Education Association, at Hotel Antlers, Indianapolis, Ind. Secretary, John H. Hinds, High School, Elwood, Ind.

Apr. 11. Industrial Education Conference, at Memorial Union, Ames, Iowa. President, Lowell L. Carver, 102 Building E, Iowa State College, Ames, Iowa.

Apr. 17–19. Michigan Industrial Education Society, at Civic Auditorium, Lansing, Mich. Executive secretary-treasurer, Eugene Watkins, 4029 Allen Court, Bay City, Mich.

Apr. 19. Utah Industrial Arts Association, at Jordan School District. Secretary, Leland V. Bangerter, 1053 — 29th St., Ogden, Utah.

Apr. 25–26. Connecticut Industrial Arts Association, at Teachers College of Connecticut, New Britain, Conn. Secretary, George Metz, Amity Regional High School, Woodbridge, Conn.

Apr. 29–May 2. American Industrial Arts Association, at Hotel Statler, Boston, Mass. Secretary, Dr. Kenneth W. Brown, P.O. Box 2626, Buffalo 26, N. Y.

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Better SCHOOL LATHES

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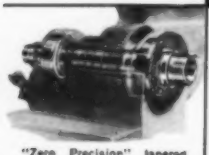

"Zero Precision" tapered roller bearings support the spindle, retain their accuracy, and eliminate costly bearing maintenance.

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TIAA STATE PLANNING COMMITTEE MEETS

The Texas Industrial Arts Association held their annual state planning committee meeting at the Roosevelt Hotel in Waco, Tex., on October 19, 1957. Seven of the eleven area clubs, three state colleges, the State Industrial Arts Consultant, one city supervisor, and the three association officers were present for this planning meeting.

The purpose of this annual meeting is to make plans for the year's activities of the state association and for the area clubs to present and discuss their problems. Committees are appointed by the president to work on the various problems the planning committee feels should be a concern of the association.

A new committee was formed this year called the "Program Planning Guides Committee" with Ray Dyche of Ft. Worth, Tex., the chairman. This committee plans to formulate ideas and make them available in printed form to each area club program chairman who would like to use them. It is hoped this service will prove beneficial to the professional improvement of the area clubs by making their program planning easier and possibly stronger in some instances.

Dr. Victor L. Bowers, Southwest Texas State Teachers College, was appointed chairman of the curriculum, research, and textbook committee.

The third committee, convention committee, will make a study of the feasibility of moving the convention about the state each year and make their recommendations known to the association.

WESTERN NEW YORK INDUSTRIAL ARTS CONFERENCE

"Ideas at Work" was the theme of the Industrial Arts Western Zone Conference held on October 25. The annual conference held on the Campus of the State University College for Teachers at Buffalo was under the chairmanship of Harold "Gene" Steffen, Associate Professor of Industrial Arts.

The morning program was devoted to shop demonstrations, public school project exhibits, and commercial exhibits. Awards for the prize-winning projects were made at the noon luncheon.

High light of the afternoon program was an illustrated address on "Principles and Procedures of Creative Thinking" by Alex F. Osborn, originator of "Brainstorming."

Mr. Osborn's address was followed by a demonstration of "Brainstorming Techniques" by Dr. Sidney J. Parnes, Director of Creative Education, University of Buffalo. All conference members were invited to participate in panel sessions applying this problem-solving technique to suggest solutions to problems

(Continued on page 10A)

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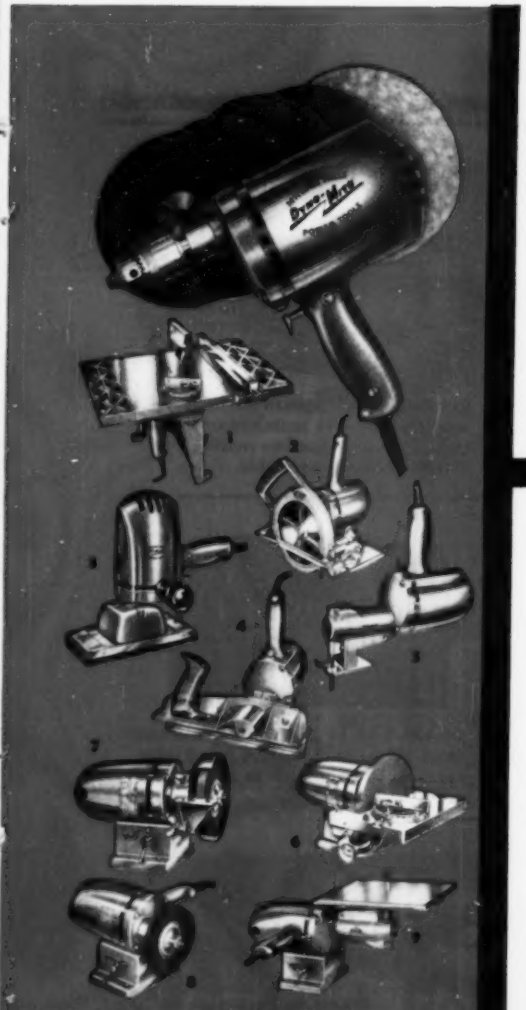

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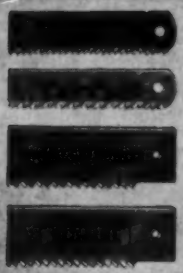

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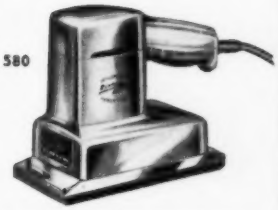

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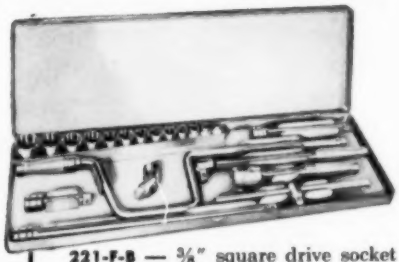

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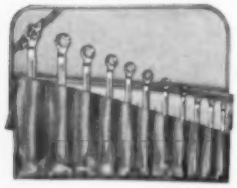

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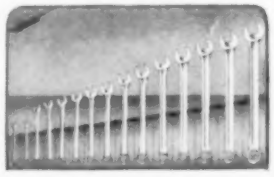
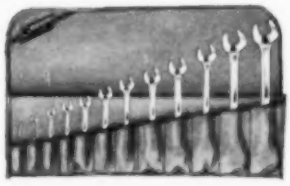
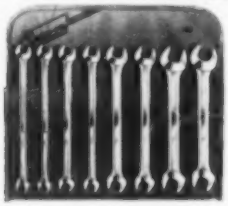


OEX-715-K — 15 Combination wrenches from 5/16" to 1¼". Combines safe Boxocket® leverage and open end nut-turning speed.



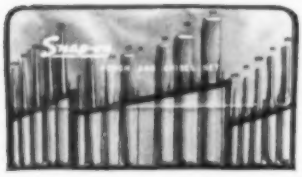
OE-812-K — 12 Open-End wrenches from ¼" to 1⅛". Covers practically every nut-turning job in automotive and tractor repair.



LTA-808-K — 4 pairs of wrenches for every tappet job. Sizes 7/16" to ⅞". Thin heads and long handles provide both speed and safety.

SNAP-ON SCREW DRIVERS — sizes and blade tips for every job. Shock-proof handles, tough well-anchored blades.

SNAP-ON PLIERS — built to last longer and work better. Grippers, cutters, needle-nose and specials.



PC-170-K — set of 17 chisels and punches. Gives you the right size and type for practically every job.

MT-315-B — motor tune-up set with 15 units to tell young mechanics what's wrong with a motor.

CG-273-H — 3-jaw medium size slide hammer puller for safe, uniform pulling of wheels, gears, etc.

TORQOMETER WRENCHES—25 models, 0-30 in. lb to 0-4000 ft lb tell specified tensions as easy as telling time.

Detailed information and illustrations of all *Snap-on* tools are included in catalog V. Write for your copy listing over 4,000 quality tools for school shop training.

SNAP-ON TOOLS
CORPORATION

8074-C 28th Avenue • Kenosha, Wisconsin

4-POSITION WOODWORKING BENCHES with locker base. 64 x 54 x 2¼ in. laminated wood top, 12 individual lockers. 2-position units have 64 x 24 or 30 x 2¼ in. laminated wood top and 6 individual lockers. Vises and other accessories available.

Take your pick of these Standard Hallowell Woodworking Benches

—they cost much less than custom-designed units, are extremely rugged, functional and attractive

Outfit a shop around these HALLOWELL Woodworking Benches. Like all other HALLOWELL School Shop Furniture, they are specially designed for use in industrial arts and vocational shops. And they have the design and construction features, materials and quality that have made HALLOWELL shop equipment a leading line throughout industry for many years.

Just one group of units in the complete HALLOWELL School Shop Furniture line is illustrated here. See our bulletin, Form 2246, for all units. Write for your copy today. Hallowell Shop Equipment Division, STANDARD PRESSED STEEL CO., Jenkintown 74, Pa.

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HALLOWELL® SHOP EQUIPMENT DIVISION SPS

JENKINTOWN PENNSYLVANIA

4-POSITION WOODWORKING BENCHES with cabinet base. All-welded interlocked deep flange construction. 64 x 54 x 2¼ in. laminated wood top. 2-position benches have 64 x 24 or 30 x 2¼ in. laminated wood top. Vises and other accessories available.

4-POSITION WOODWORKING BENCHES with open base. 64 x 54 x 2¼ in. laminated wood top. 2-position benches have 64 x 24 or 30 x 2¼ in. laminated wood top. Available in 3 heights: 31¼, 33½, 35¾ in. Vises, shelves and other accessories available.

ASSOCIATION NEWS

(Continued from page 6A)

which confront industrial-arts teachers today.

Those attending the evening dinner were privileged to hear an address by Dr. Kenneth F. Perry, chairman of industrial arts at Colorado State College, and president of the American Industrial Arts Association. The title of Dr. Perry's talk was "We Are Always Right."

Newly elected officers for next year's conference are: chairman, Donald Dayer, East Aurora High School; vice-chairman, Owen Harlan, Buffalo State; and secretary, Michael O'Connell, Nicols School, Buffalo.

CONNECTICUT INDUSTRIAL ARTS ASSOCIATION

The Connecticut Industrial Arts Association is planning its 25th anniversary convention to be held at the Teachers College of Connecticut in New Britain, Conn., on April 25 and 26, 1958.

New buildings on the campus will be available for the first time to house commercial and project exhibitions, and many of the meetings and banquets. Dormitory space is being reserved for men who plan to stay on campus overnight during the affair.

The program has been expanded considerably from the usual annual convention and a number of special events are being planned.

Industrial arts men from various parts of the country may find it enjoyable and convenient to stop at this special meeting while on their way to Boston for the American Industrial Arts Association convention which opens the following Monday. — *Russell H. Anderson, publicity chairman.*

AMERICAN VOCATIONAL ASSOCIATION

G. Henry Richert and George Sanders, program specialists in distributive education, A.V.A., Washington, D. C., attended a meeting of representatives of agricultural-allied industries, organizations and educators, held at Washington, D. C.

The National Sales Executives' "Farm Youth Program" was presented to the group and received enthusiastic support from all sides. The program proposes to carry out an educational program to alert farm youth to their opportunities in the field of agricultural selling. Two tools were presented, a film which outlined the problem and showed the importance of the selling function to a vigorous and progressive agricultural economy, and second, a booklet, "There's a Future in Your Farm Background."

James H. Pearson, assistant commissioner for vocational education, participated in the 15th Annual Conference of Professional Agricultural Workers at Tuskegee Institute.

The theme of the conference was "Agricultural and Related Services for a Changing Rural Population."

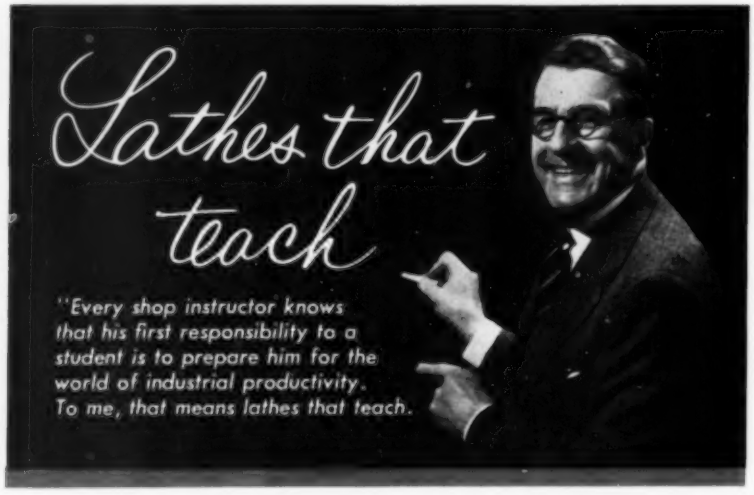
Mr. Pearson spoke on trends that have implications for vocational education.

Several members of the Trade and Industrial Education Branch met with Bernard Michaels, labor economist, Bureau of Labor Statistics, U. S. Department of Labor, on Friday December 6, to review the draft of a report "Employment Outlook for Technicians." Of particular interest was the section dealing with training of technicians.

John P. Walsh, director, trade and industrial education branch, was one of 50 educators invited by the Secretary of Labor to a national meeting on "Education and Employment," held in Washington, D. C., on November 12 and 13, 1957.

Pointing out that conference discussion would be devoted to long-term projects of 10 to 20 years dealing with the quality of education and providing an adequate supply of trained personnel for industry, Secretary Mitchell stressed the problems of training in industry, the need for on-the-job training, the need for assembling instructional materials, and the need for a stepped-up program for training both apprentices and managers.

He indicated that the responsibility of the Department of Labor, Bureau of Apprenticeship and Training, was primarily to promote apprentice training within industry and that the personnel of the Department were not educators.


Lathes that teach
"Every shop instructor knows that his first responsibility to a student is to prepare him for the world of industrial productivity. To me, that means lathes that teach.

"Running a metalworking lathe is exacting work that requires skilled, *precision* operation. One of the best ways I know to instill this pride of workmanship in young lathe operators is to let them learn their trade on this sustained-accuracy Logan 11" screw cutting lathe.

"Our schools know from experience that *all* Logans are dynamically tested and balanced for utmost minimum of vibration before leaving the factory. It's apparent in their extra years of precision performance. We like the way, too, that Logan ball bearing spindles need no bearing adjustment, regardless of speed or load. They're *pre-set* to retain original accuracy far longer than customary with plain or tapered roller bearings.

"Add these up, and you get *another* reason for Logan popularity in our schools . . . Their reduced maintenance means more dollars for other shop needs!"

Logan 11" swing lathe . . . 16-speed
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Personal News

NEW JERSEY EDUCATOR DIES

Owen E. Kiser, New Jersey State supervisor of vocational agricultural education, died recently at Middlesex General Hospital, New Brunswick. He was on the faculty of Rutgers University (the State University of New Jersey).

Professor Kiser had served for several years as a Borough Councilman, and as president of the Milltown Council, and as head of its finance, street and utility committees.

A graduate of Pennsylvania State College, class of 1925, he started his career as a high

(Continued on page 26A)

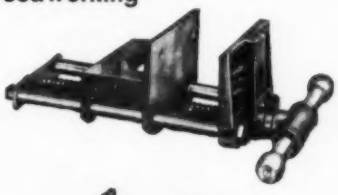
BE ABSOLUTELY SURE, SPECIFY

MORGAN VISES

for every school shop need

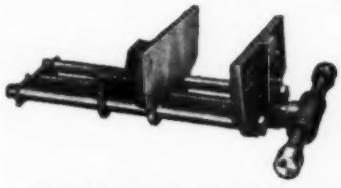
65 years of engineering and manufacturing skill plus rigid inspection and strict quality control make possible an UNCONDITIONAL GUARANTEE—giving you sureness of choice from vises that combine high quality semi-steel castings with skilled and accurate machining.

For Woodworking



solid nut continuous screw vise

Semi-steel castings, cold rolled screw, solid nut, cold rolled side bars — all machined to close tolerances — tubular steel, aluminum or wood handle — similar model available with adjustable steel handle and stop in front jaw.

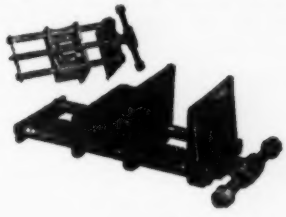


quick action vise

Semi-steel castings accurately machined, tubular steel handle, cold rolled screw with intercepted threads operates in a half nut, slight twist-of-the-wrist disengages, engages screw quickly — freeing or locking work in place.

Semi-steel castings machined to close tolerances, continuous buttress thread screw cut from heavy cold rolled stock, floating nut gives rapid action with smoother screw action, adjustable stop built into front jaw — this new devlopment combines speed of Rapid Action with smooth screw action of a Continuous Screw Vise.

18A dual purpose vise



Fully machined, rugged semi-steel vise at economy prices, solid nut continuous screw action, stop in front jaw, wooden handle.

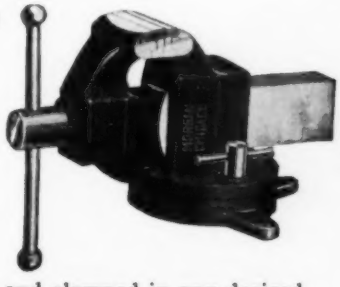
junior woodworker's vise

All woodworking vises built to fit fluhs on 2¼" bench top.

For Metalworking

Solid Jaw Swivel Base

machinists' bench vise



Solid Jaw Stationary Base

machinists' bench vise

May be rotated 360 and clamped in any desired position — smooth and perfect working from milling of engaging parts, careful workmanship, close inspection — specially designed nut locks base — no play despite heavy duty.

Dependable strength and extreme rigidity — special semi-steel casting and accurate milling of sliding bar — solid steel forged screw engages a malleable iron nut acme threaded — interchangeable tool-steel faces — unsurpassed service.

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Photos and step-by-step constructional details on more than 90 useful and colorful projects. Best ways to saw, machine, polish, heat form, cement and clean plastics. Special section on internal carving.

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Top-notch course in elementary Craftwork.

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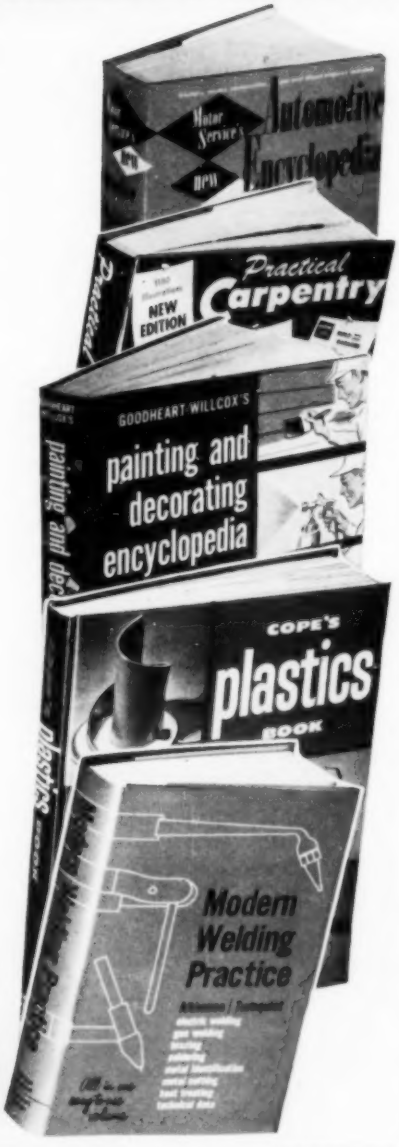

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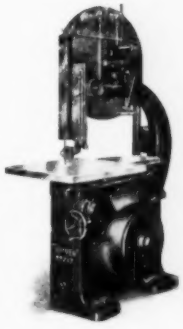
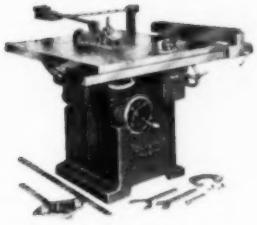
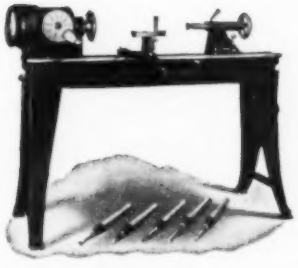

Demand for thorough training calls for OLIVER machines

Today's need for sound basic vocational training of students is satisfied only by excellent instruction plus sturdy woodworking machines. Your students learn most on the machines used by industry.

Oliver machines are built to endure years of rugged service. Efforts of instructors are made easier and most effective. Furthermore, Oliver machines are safest to use.

Your students will find Oliver machines can be set up quickly and accurately. Self-locking devices keep the machines in perfect adjustment.

In nearly 2400 vocational shops instructors agree that Oliver machines give more and finer service. The machines shown here are but a few of a complete line to meet the demand for thorough training.

Oliver equipment for vocational shops . . .

Band Saws	Saw Benches	Tenoner	Surfacers
Mortisers	Cut-Off Saws	Jointers	Oilstone Tool Grinders
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DURO *New Design* POWER TOOLS

for Quality!
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See why DURO offers the greatest power tool values!

More and more school shops throughout the country are adopting Duro Power Tools as standard equipment in their workshops. Students find they can produce better projects in less time—in safety. Instructors enjoy the built-in ruggedness, the extra capacity and precision each unit offers. Superintendents and board members appreciate the lifetime quality and budget price which makes them practical additions to long range planning.

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Send for FREE power tool catalog, Comparison Chart, and Shop Plan Guide!

All 3 are free. You will get a graphic picture of Duro superiority where it counts most—in size, capacity, features and PRICE! Write today.

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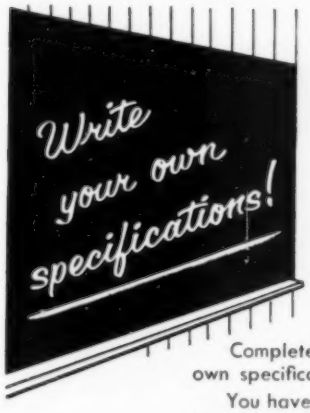


COLUMBIAN WOODWORKERS' VISES MEET EVERY NEED . . .

Completely redesigned, Columbian Woodworkers' Vises offer you a real opportunity to write your own specifications—exactly as you want them!

You have your choice of 2 sizes—specify (7) for 4 x 7" jaws with 9" opening or (10) for 4 x 10" jaws with 12" opening. Also your choice of 2 different continuous screw mechanisms—specify (R) for Rapid Acting "Power-Slide" Nut, or (C) for Solid Nut type. You may select between (P) Plain or (D) Dog type front jaws. You may specify (W) Seasoned Hardwood Handle, (T) Tubular Steel Handle, or (S) Adjustable Steel Handle.

For example, No. 7CDW specifies 4 x 7" jaws, 9" opening, solid nut mechanism, dog type front jaw, seasoned hardwood handle—old catalog No. 5CD.

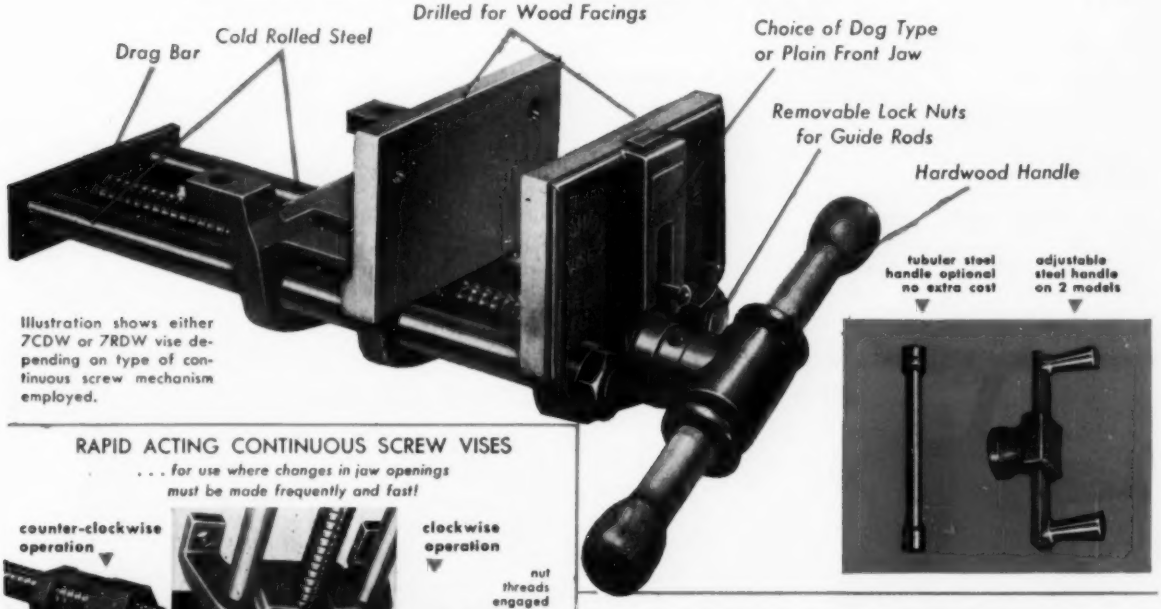

Drilled for Wood Facings
Drag Bar
Cold Rolled Steel
Choice of Dog Type or Plain Front Jaw
Removable Lock Nuts for Guide Rods
Hardwood Handle
tubular steel handle optional no extra cost
adjustable steel handle on 2 models

Illustration shows either 7CDW or 7RDW vise depending on type of continuous screw mechanism employed.

RAPID ACTING CONTINUOUS SCREW VISES

. . . for use where changes in jaw openings must be made frequently and fast!

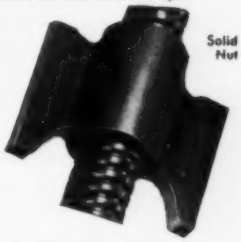
Rapid Acting "Power-Slide" Continuous Screw Mechanism

Key to superior operation is exclusive "Power-Slide" mechanism. This incorporates a gravity friction clutch which assures positive operation (no springs) and automatically compensates for wear. Counter-clockwise operation of screw disengages mechanism, facilitating "free sliding" adjustment of jaw opening. Clockwise operation of screw engages full 180° half-nut, producing continuous inward jaw movement and high pressure holding without slippage.

SOLID NUT CONTINUOUS SCREW VISES

. . . for general woodworking in industrial and school shops!

▲ **Solid Nut Continuous Screw Mechanism**



Heavy steel screw is made with double lead, fast running thread to provide maximum speed of operation. Solid Nut assures long, repair-free life.

2 models of Solid Nut Continuous Screw Vises are made with special Adjustable Steel Handles for extra fast operation.

COLUMBIAN Vises

The Columbian Vise & Mfg. Co.
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Tool Catalog No. 34 **Electric Tool Catalog No. 57E**

These Stanley Catalogs are particularly useful books of reference and tool information for the shop teacher.

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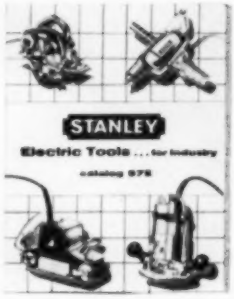
Use the coupon to send for your free copies of both catalogs. Catalog No. 34 has a special school index based upon Stanley's long experience and the advice of educators. We will also include a 9-page list entitled *"Suggested Specifications for Equipping a General Shop."*



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NO. 40 WOOD CHISEL

This sturdy chisel has 4½" one-piece alloy steel blade and tough plastic handle permanently attached. Complete range of sizes. Trouble-free tool with long useful life in school shops.

NO. 118 BLOCK PLANE

An all-steel, low angle block plane, this Stanley "100 PLUS" tool consists of only 3 pieces and the locked-in cutter adjustment prevents thread stripping or lost parts.

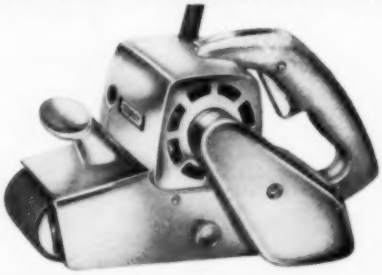
NO. 610 HAND DRILL

This hand drill has enclosed gears for maximum safety, a solid handle and a chuck that cannot come off the spindle. Jaw springs protected.

HEAVY DUTY ELECTRIC TOOLS

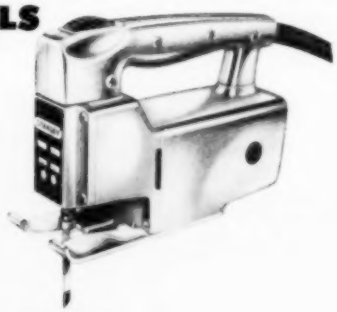
H36 ORBITAL SANDER

The Stanley Orbital Sander is tops for finishing or refinishing work. It's a fast cutting tool, ideal for flush sanding. Paper changing is fast and easy. ⅓ of standard sheet.



H31 BELT SANDER

The Stanley Belt Sander takes the work out of sanding, whether it's for rough sanding or fine finishing of wood, metal or plastic. Easy to change 3" x 24" belts.



H75 SABRE SAW

The sabre saw is a versatile portable saw furnished with three blades and eighteen more to select for every use. It will rip, crosscut or jig saw and will also cut plastics, rubber and metal.

Use this coupon for more detailed information and school shop help

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NEW CLAUSING 10" SAW

Typical of reports from shops equipped with Atlas-Clausing saws is this one from Gilbert R. Hutchings, Industrial Arts Department, Western Michigan University. "I have found the Clausing saw to be not only the best circular saw but the most for the money. My students show a strong preference for it – prefer using it to other makes in our shop. It is an unusually fine saw, with many features that I highly recommend for school shop use."

The Atlas-Clausing tilt-arbor saw, for example, gives you performance never before achieved in a 10" saw!

It's ruggedly built with 3 HP construction throughout. Has totally enclosed 1 to 3 HP continuous duty motors . . . cast iron base . . . modified wedge cog belt drive . . . big, self-cleaning worm and rack blade-positioning mechanisms.

It's unmatched for safety. Has exclusive clear-vision guard, double locking fence, big mitre gauge with 8¾" x 2" face. Motor enclosed in base.

It's easy to operate. Weight of motor is balanced by torsion spring mechanism – positioning the blade is almost effortless. Fence glides to the position you want it – lifts off for removal or positioning either side of blade. Handwheels are 8" in diameter – exclusive tilt dial is bigger, too, for easy reading.

And the Atlas-Clausing is way ahead in value as a comparison will quickly show. See this and other Atlas-Clausing *plus-value* machine tools before investing in any equipment for your shop.

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Smoothest operating of *any* 24" jig saw. Has exclusive, precision - balanced crank-type drive mechanism. Oil bath lubrication. 14" x 14" precision ground table is supported by *two,* large, *widely-spaced* trunnions. Other superior features include: constant-flow air pump, universal chucks. 3/16" steel plate safety stand.

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"Light-Heavyweight" MACHINE TOOLS

- ***Built to highest industrial standards!***
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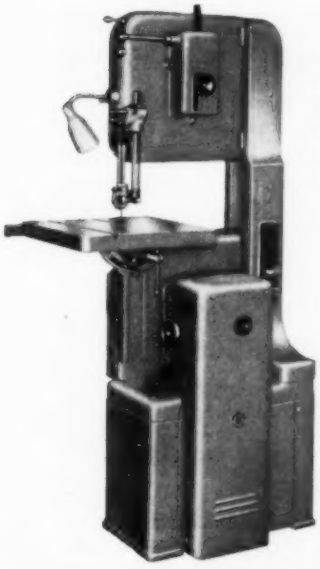
The extreme accuracy, big capacity, and ease of operation of these versatile Walker-Turner "Light-Heavyweights" make them ideal for the school shop. Each unit is safety-engineered for complete student protection and is ruggedly built to take hard usage. And, as their record in industry proves, these "Light-Heavyweights" can't be equalled for long life and low maintenance.

Ask your W-T distributor to demonstrate how Walker-Turner "Light-Heavyweight" Machine Tools can make your teaching job easier and more resultful. He's listed under "Tools" in your telephone directory. Or mail the coupon below for details.

"LIGHT-HEAVYWEIGHT" 10" TILTING ARBOR SAW. Big table—45¾" x 32½", with extensions. Capacity: 3⅛" with 10" blade, 2⅛" at 45°; 1⅛" with 6" dado. Motor and arbor tilt as a unit. Control wheels located at operator's hand. Rip fence locks at front and back simultaneously. W-T 8" and 14" models also available.

"LIGHT-HEAVYWEIGHT" 16" VARIABLE-SPEED BAND SAW. Speed can be varied from 50 to 4500 sfm, while machine is running. Cuts wood, plastics or metal. Wheels and blade are unusually well guarded. Equipped with Carter quick-change tires. W-T band saws also made in 12" and 14" models.



"LIGHT-HEAVYWEIGHT" VARIABLE-SPEED LATHE. Primarily for woodworking, but also can be used for metal spinning. Speed can be changed from 660 to 3550 rpm while machine is running. Swing over gap—15½"; over bed—12"; distance between centers —38". Drive and motor are completely enclosed.

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- Perform All Standard Milling Operations
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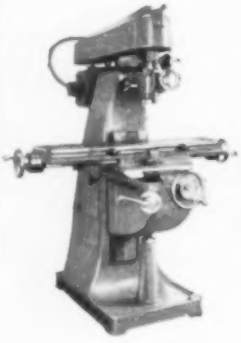

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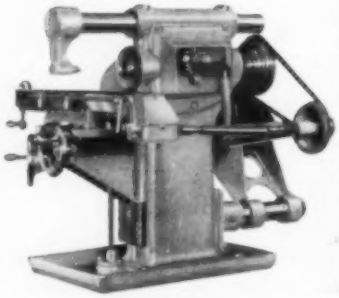

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Locker and Cabinet Base WOODWORKING BENCHES

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3 TYPES OF BENCHES — TAKE YOUR CHOICE. Size is 64″ long, 50″ deep and 33¾″ high. The laminated edge grain maple top is 2¼″ thick and has end bolsters.

1. No. 64-50-402C has two steel cabinets (back-to-back). Each cabinet is 36″ wide, 21″deep and 31″ high.

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All doors equipped with spring hinges and padlock attachments.

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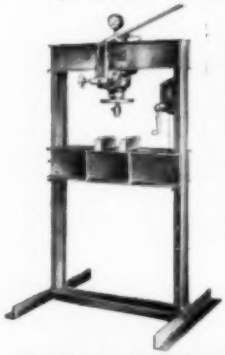

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Includes pressure gauge, hand wheel for rapid advance, automatic ram return, and table lifting device. 25 tons capacity.

DAKE ARBOR PRESSES

Have large opening and slotted table plates. Available in single and compound leverages, with capacities from 1 to 25 tons.

Catalog No. 350 describes Dake Presses suitable for school shops. Write for a free copy.

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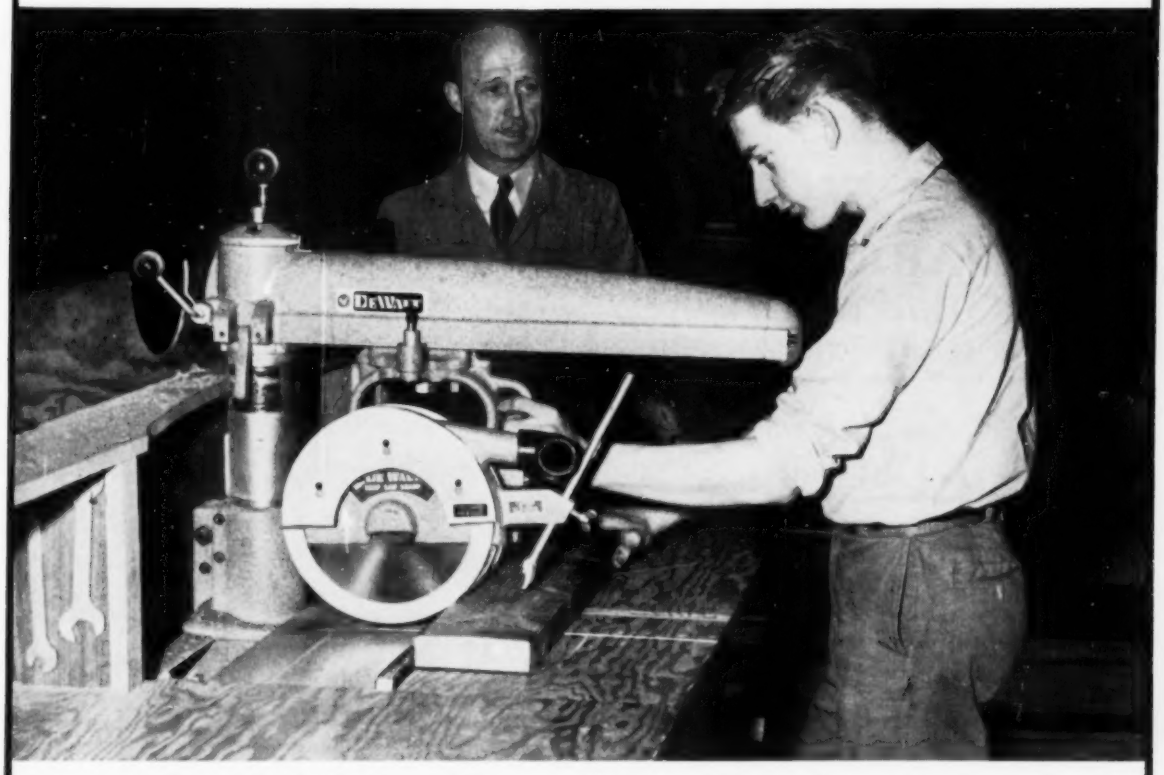
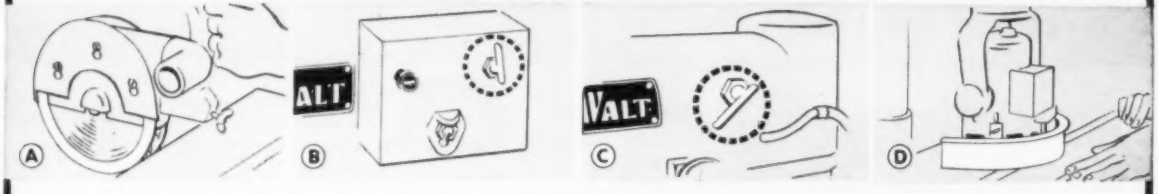


And De Walt® has the safest record in industry!



You need these exclusive operating safety features: **A**—Simpler, safer top-side cutting with exclusive safety guard. See your mark *and* your saw. **B**—Power brake stops saw in 4 seconds for *added* safety. **C**—Safety key switch prevents unauthorized use. **D**—De Walt becomes tilting arbor shaper with exclusive shaper guard—gives 50% more shapes per cutter. Combines 12 basic power tools. Builds into workbench, gives safer straight-line handling.

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2 popular sizes for schools...GW-I, 1½ hp, 10″ size for industrial arts...GA-N, 3 hp, 12″-14″ size for vocational training.

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PARKS PLANERS Give Your Students Practical Experience on Popular Industrial Machines

Students learning on Parks Planers benefit not only from the safe, easy, and accurate operation of these planers, but also from the practical experience of working on the same type of high-speed, precision built planers they will eventually use in their trade. The Parks No. 20, 20" Planer (at right) has a 4-knife cutter-head with a speed of 3600 R. P. M. and offers two feed speeds—20 and 40 F. P. M. or 40 and 80 F. P. M. Available with knife-grinding attachment at additional cost.

THE **PARKS** No. 20
20" Thickness PLANER
WITH KNIFE-GRINDING ATTACHMENT

THE **PARKS** HEAVY-DUTY
12" Thickness PLANER

At left is the Parks Heavy-Duty 12" x 4" Planer—a compact, sturdy thickness planer with feed speed of 16 F. P. M. at 4000 R. P. M. Will handle material as short as 6" and as thin as 1/4". Both planers are priced low enough for even the most modest shop budget. WRITE FOR COMPLETE DESCRIPTIVE LITERATURE.

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MANUFACTURERS OF QUALITY WOODWORKING MACHINES SINCE 1887

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CHROME PLATED SAW BLADES
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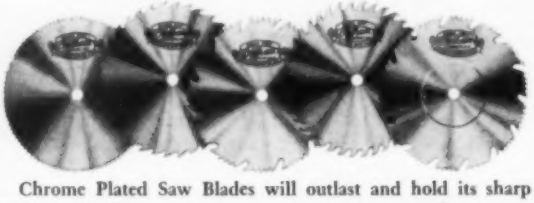
COCKER SAW CO., INC.
For Industry and Home Hobbyist



Chrome Plated Saw Blades will outlast and hold its sharp cutting edge five to seven times longer between sharpenings than unchromed saw blades.

COCKER's prices are the same as competitor's unchromed saw prices.

To sharpen, use your regular method by filing or grinding wheel.

Instructors have tested and approved these chrome plated blades for school use.

Remember: Only COCKER offers you Industrial Chrome Plated Saw Blades.

Write for literature and prices which will illustrate COCKER's New Brazed Tipped Dado Head unconditionally guaranteed to out-perform all others.

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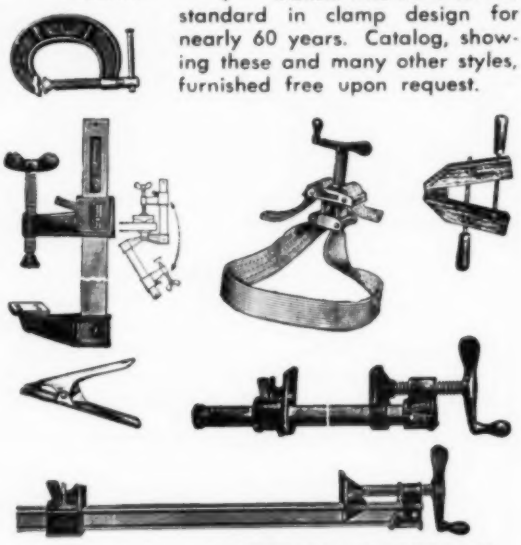

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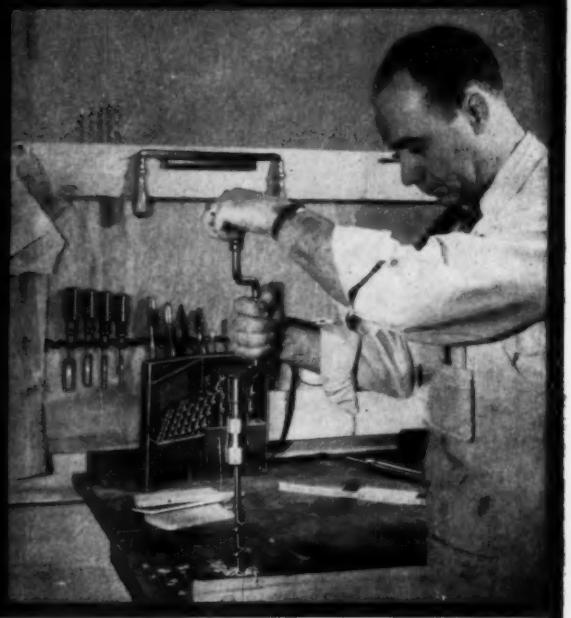
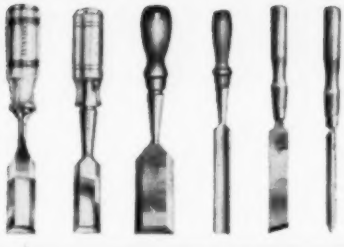
Made with utmost care to assure free, easy boring and fast chip clearance. Solid-center design for extra strength, smooth operation. Accurately sized, perfect cutting edges. "Plastic-Sealed" to reach you factory-sharp. Can be purchased singly or in handy bench sets and steel boxes as shown at right (also in plastic rolls).

Better Shopwork with fine hand tools by GREENLEE

Good workmanship comes easily with GREENLEE tools. All are carefully formed and finished for accuracy and correct cutting edges and are properly heat-treated for long life. They are made by craftsmen for craftsmen.





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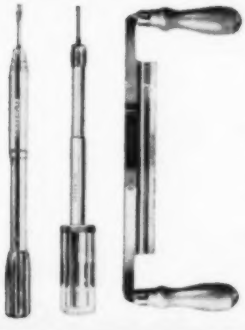
Various types of tang butt, socket butt and firmer chisels with durable green plastic or hickory handles. Outside and inside bevel socket gouges. Short and full-length turning tools.

EXPANSIVE BITS, DRILLS, ELECTRIC-DRILL BITS

Fast, easy-boring expansive bits with positive chip clearance. Two styles: Setfast with quick adjusting-locking feature, and Plain type. Wood-boring brace drills and solid-center electric-drill bits in various sizes.



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Free-running, fast action GREENLEE spiral screw drivers are available in two models: Enclosed Spiral for extra safety and grit-free operation, and Open Spiral. Automatic push drills are smooth operating with automatic spring return . . . handle holds eight drill points. GREENLEE drawknives are light in weight and have sturdy, rigid blades for accurate work.

The GREENLEE line also includes many other time-saving tools for students and shop workers: Bit Extensions, Electricians' Bits, Tubing Benders, Radio Chassis Punches, and many more. Write for free catalog No. 35-H.

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Years of rugged service even in your students' hands!

EASIER HANDLING! Handle positioned to eliminate nose or tail heaviness. No starting twist.

FASTER! B&D Impact Wrench hits maximum torque in 6 seconds, twice as fast as competitive tools.

REVERSIBLE! Full power in either direction. Reversing ring design prevents accidental starting.

HANDY KIT! Protects tool and equipment, keeps everything handy, saves time in training students.

Black & Decker Impact Wrench given torture test for POWER-BUILT ruggedness

Here's a tool that's really power-built to stand up under inexperienced student handling! Before we introduced the No. 100 Impact Wrench we put it through a gruelling torture test. We compressed its impactor spring 100 million times—ran the tool continuously for over 600 hours—without a single sign of failure! That's why we say you can't buy a better, longer-lived, more economical impact wrench!

And your students will really like using it! The No. 100 Impact Wrench takes the back-break out of removing lugs and bolts—spins 'em in and out as slick as a whistle. Full power in either direction.

See how the impact wrench your students will use on the job can help your training now. Call your local B&D distributor for a free demonstration. THE BLACK & DECKER MFG. CO., Dept. 4503, Towson 4, Maryland. (In Canada: P. O. Box 278, Brockville, Ont.)

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Industrial Arts and Vocational Education
The Shop Teachers' Professional Magazine
MARCH 1958

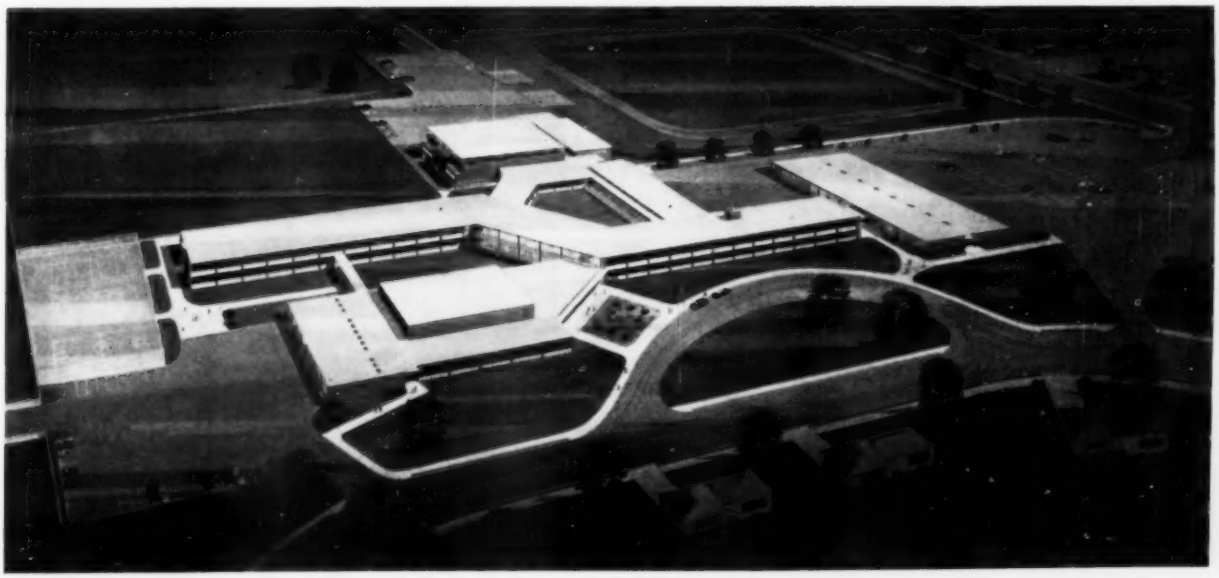
W. Tresper Clarke Junior-Senior High School

EDWARD J. McCLEARY
Superintendent of Schools
East Meadow, L. I., N. Y.

The W. Tresper Clarke Junior-Senior High School, located in the East Meadow School District on Long Island, has a capacity of 2660 students according to New York State standards. It is a comprehensive school because the senior high school area contains admirable facilities for college preparatory courses, a general course, business education courses, and a technical-vocational wing which includes facilities for trade and technical education. This article will be fundamentally concerned with matters that pertain to the technical curriculum although there are many trade shops included in the technical-vocational wing such as practical nursing, beauty culture, dressmaking, food trades, building trades, and metal fabrication. Since much has already been written in this publication regarding trade shops, I hope to explain some of the best considered thinking in New York State relative to technical education. These courses that are offered in technical education result from the adoption of a dual-purpose curriculum which offers students who have completed the ninth grade, an unusual opportunity to combine academic education with technical education.

The philosophy involved may be summarized as follows. Historically the people of our great country have looked upon preparation for work as an indispensable part of a school program designed to give unity and direction to life. This is obvious by the great increase in the number of colleges and technical institutes in the United States during the twentieth century. However, high schools have been slower to recognize the need to provide preparation for earning a living. This we are try-

(Continued on page 63)

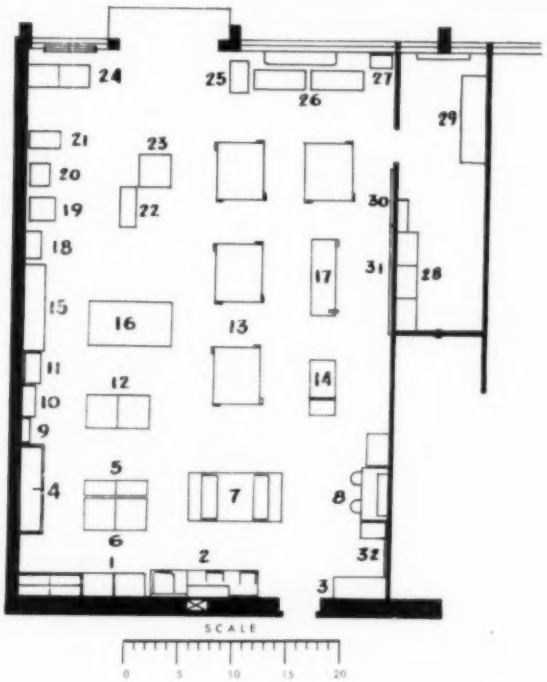


W. Tresper Clarke High School, East Meadow, N. Y. Designed by Frederic P. Wiedersum Associates
— Photo, Kennedy Associates, Rockville Centre, N. Y.

Room No. 21. Room No. 22 is identical, except reversed.

Radio, electro-plating, machine shop, molding

1. Corkboard; 2. desk; 3. sink; 4. electroplating bench; 5. electric bench; 6. paper cutter; 7. storage; 8. chalkboard; 9. corkboard; 10. demonstration table; 11. electric bench; 12. radio bench; 13. (2) type cases; 14. proof press; 15. drying rack; 16. bookbinding table; 17. tool panel; 18. power panel; 19. desk; 20. lever cab.; 21. press; 22. imposing table; 23. silk screen table; 24. platen press; 25. buffer; 26. shaper; 27. outboard motor; 28. aircraft engine; 29. auto engine; 30. metalwork bench; 31. jig saw; 32. drill press; 33. shear; 34. art-metal bench; 35. soldering bench; 36. heat-treat furnace; 37. grinder; 38. power hacksaw; 39. sheet-metal bench; 40. milling machine; 41. forge; 42. anvil; 43. vertical bar rack; 44. lathe; 45. unit ventilator; 46. lathe cab.; 47. lathe; 48. molding bench; 49. welding bench; 50. canopy hood.

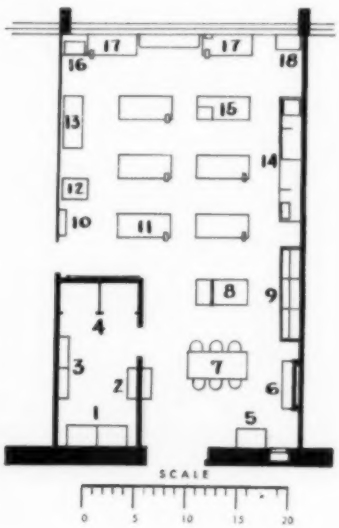


Room No. 20 and 23 Ceramics, Textile, Woodwork

1. Potter's wheels; 2. sink and counter; 3. sink; 4. ceramics bench; 5. drying shelves; 6. kilns; 7. ceramics bench; 8. planning table; 9. ironing board; 10. storage; 11. sewing machine; 12. floor looms; 13. (4) woodworking benches; 14. desk; 15. textile table; 16. textile table; 17. demonstration table; 18. miter saw; 19. drill press; 20. sander; 21. jig saw; 22. jointer; 23. circular saw; 24. lumber rack; 25. band saw; 26. wood lathes; 27. grinder; 28. storage; 29. finishing bench; 30. tool panel; 31. chalkboard; 32. corkboard.

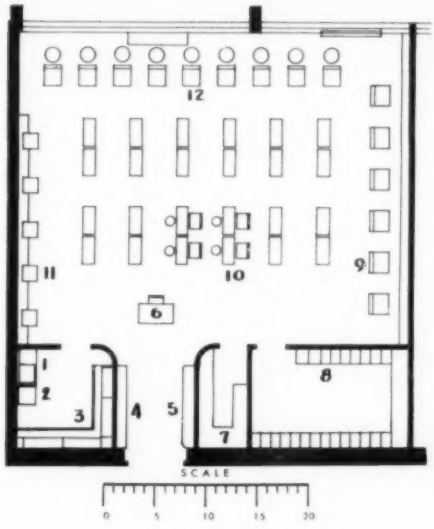
Room No. 23

Room identical to Room No. 20, except reversed.



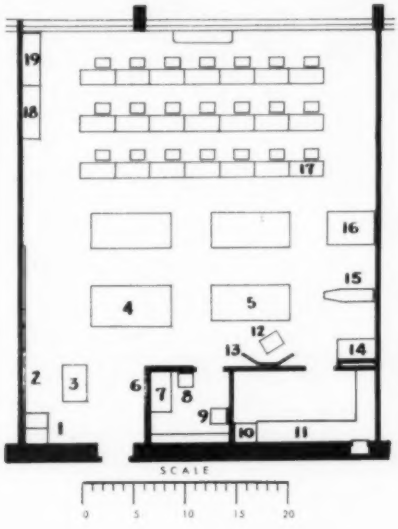
Room No. 144. Metalwork

1. Vertical bar rack; 2. parts bin; 3. shelves; 4. storage; 5. teacher's wardrobe; 6. sink; 7. conference table; 8. desk; 9. counter; 10. power panel; 11. (5) benches with vises; 12. drill press; 13. engine lathe; 14. bench with gas and air; 15. insulation bench; 16. grinder; 17. (2) benches with vise, gas, and air; 18. oven.



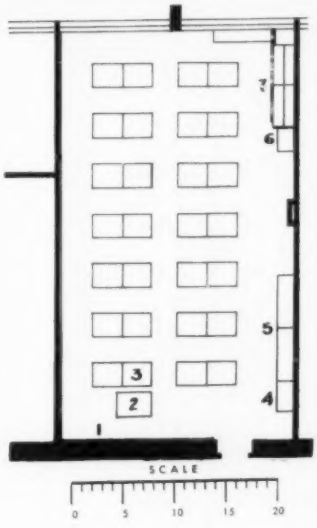
Room No. 131. Beauty Culture

1. Sink; 2. gas range; 3. shelving; 4. display case; 5. seat; 6. receptionist desk; 7. shelving; 8. lockers; 9. dresserette with (6) chairs; 10. (24) manicure tables; 11. dresserette with (5) sinks; 12. (9) hairdriers.



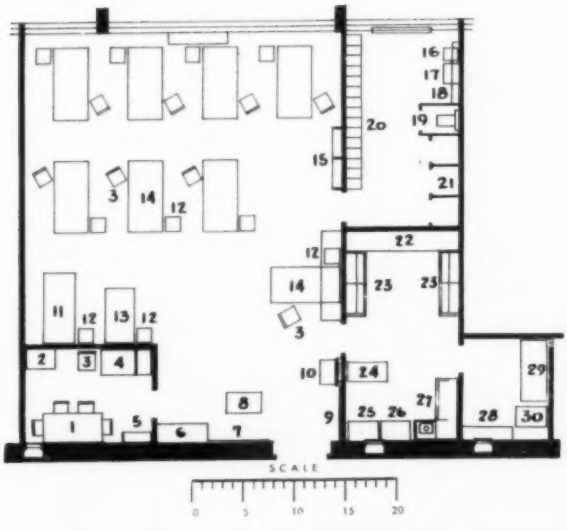
Room No. 133. Clothing

1. Files; 2. chalkboard; 3. desk; 4. cutting table; 5. (3) student tables; 6. tackboard; 7. case; 8. table; 9. chair; 10. instructor's wardrobe; 11. counter; 12. fitting stand; 13. triple mirror; 14. sink; 15. ironing board; 16. pressing table; 17. (21) sewing machines; 18. illustration material; 19. tote trays.



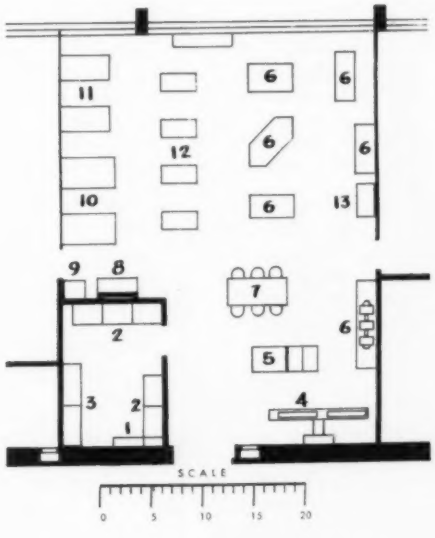
Room No. 138. Drafting Room

1. Chalkboard; 2. desk; 3. (28) drafting tables; 4. wardrobe; 5. (2) tote trays; 6. storage; 7. paper storage.



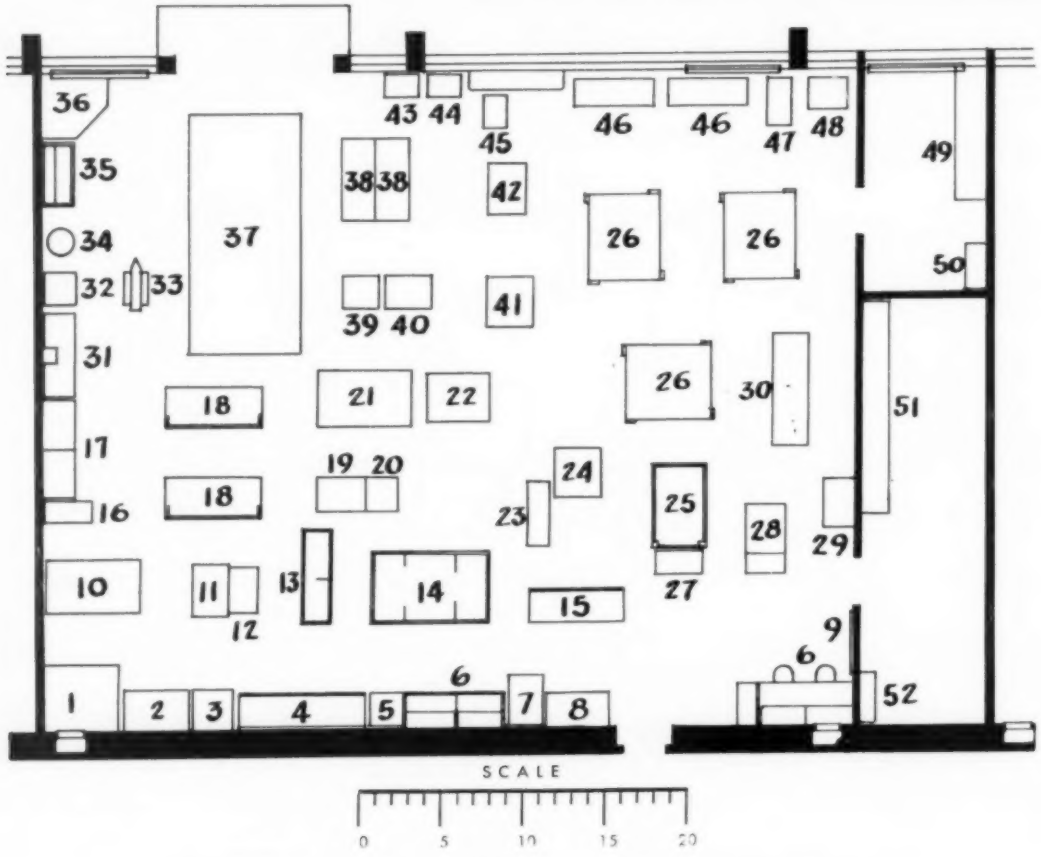
Room No. 134. Home Nursing

1. Table; 2. instructor's case; 3. (9) chairs; 4. desk; 5. bookcase; 6. illustrative materials; 7. chalkboard; 8. desk; 9. corkboard; 10. sink; 11. home-style bed; 12. (10) tables; 13. crib; 14. bed; 15. bookshelves; 16. waste can; 17. sink; 18. make-up shelf; 19. toilet; 20. lockers; 21. (3) dressing booths; 22. shelving; 23. shelving with counter top; 24. table; 25. bedpan sterilizer; 26. hopper; 27. sink; 28. shelving; 29. stretcher; 30. wheel chair.



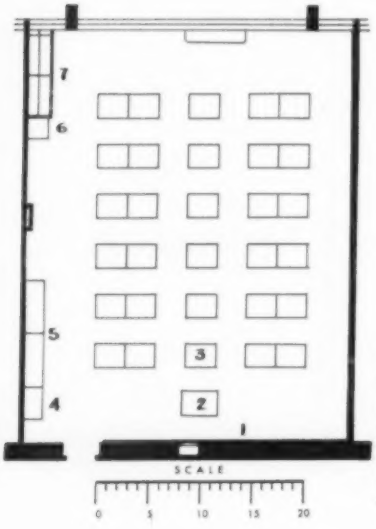
Room No. 145. Experimental Lab

1. Parts bin; 2. shelving; 3. storage; 4. power panels; 5. desk; 6. concrete pad with equipment; 7. conference table; 8. sink; 9. teacher's wardrobe; 10. (2) transformers; 11. (2) experiment benches; 12. (4) concrete pads.



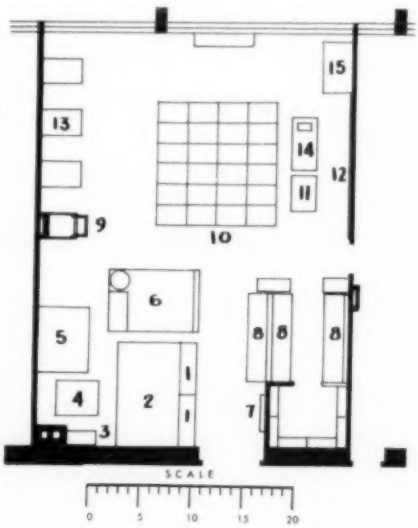
Room No. 142. Printing, Bookbinding, Woodworking, Metalworking

1. Pattern press; 2. paper storage; 3. paper cutter; 4. electrical bench; 5. kiln; 6. counter; 7. potter's wheel; 8. sink; 9. table; 10. cabinet; 11. imposing table; 12. drying rack; 13. bookbinding bench; 14. radio bench; 15. ceramics bench; 16. portable hack saw; 17. vertical bar rack; 18. silk screen bench; 19. proof press; 20. lever press cabinet; 21. sheet-metal bench; 22. squaring shear; 23. jointer; 24. circular saw; 25. textile bench; 26. (3) benches with lockers; 27. sewing machine; 28. desk; 29. teacher's wardrobe; 30. demonstration bench; 31. soldering bench; 32. heat-treating furnace; 33. anvil; 34. melting furnace; 35. molding bench; 36. arc welding bench; 37. automobile space; 38. (2) metal lathes; 39. milling machine; 40. metal shears; 41. break and slip rolls; 42. band saw; 43. grinder; 44. buffer; 45. drill press; 46. (2) wood lathes 47. jig saw; 48. belt sander; 49. finishing bench; 50. paint storage; 51. lumber rack; 52. small parts bin.



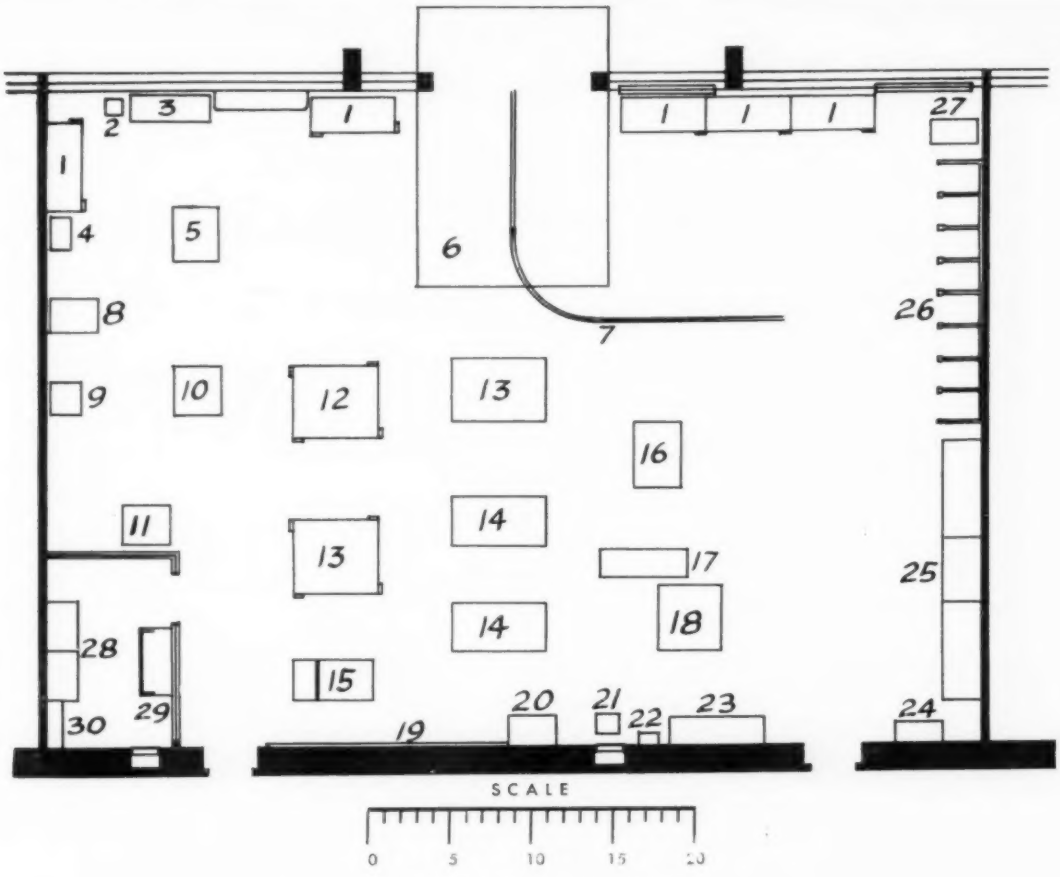
Room No. 143. Drafting

1. Chalkboard and tackboard; 2. desk; 3. (30) drafting tables; 4. instrument case; 5. (2) tote trays; 6. storage; 7. paper storage.



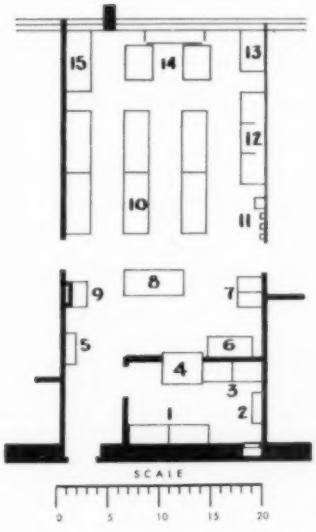
Room No. 166. Boilers and Pumps

1. Portable benches; 2. dynamometer; 3. radiator tank; 4. boiler; 5. compressor; 6. jet pump, centrifugal pump, reciprocating pump; 7. power panel; 8. bench; 9. sink assembly; 10. (24) chairs; 11. desk; 12. chalkboard; 13. (3) benches; 14. demonstration table; 15. MG set and panel.



Room No. 147. Woodworking

1. (4) Bench; 2. pedestal rest; 3. wood lathe; 4. knife and tool grinder; 5. band saw; 6. concrete slab; 7. monorail with 2-ton hoist; 8. drill press; 9. belt and disk sander; 10. shaper; 11. mortiser; 12. (2) woodworkng bench; 13. glue bench; 14. layout table; 15. desk; 16. single surfacer; 17. jointer; 18. circular saw; 19. chalk and corkboard; 20. teacher's wardrobe; 21. waste can; 22. drinking fountain; 23. sink; 24. storage; 25. radial saw with roller extension tables; 26. lumber rack; 27. jig saw; 28. storage; 29. counter; 30. small parts.



Room No. 150. Electricity

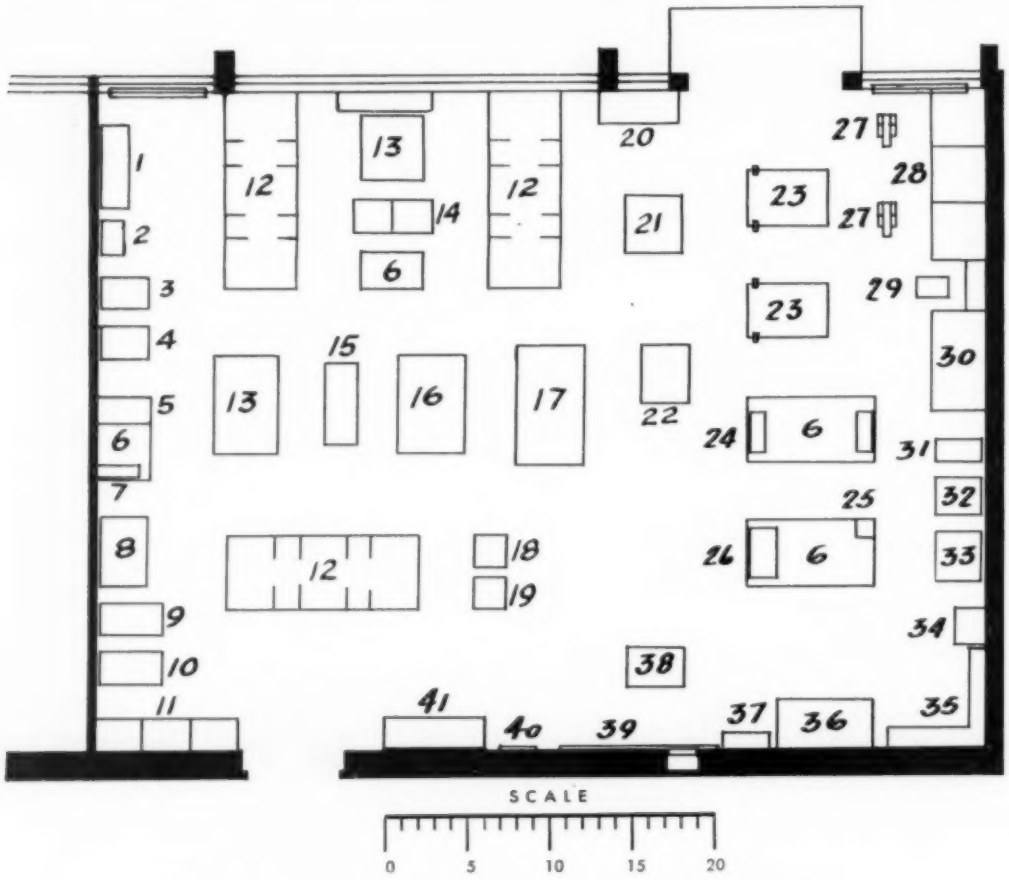
1. Instrument storage; 2. parts bin; 3. shelving; 4. switchboard; 5. book shelves; 6. concrete pad; 7. files; 8. experimental table; 9. sink; 10. (6) benches; 11. (4) power transformers; 12. wall bench; 13. electronic heating; 14. machinery; 15. bench for amplisfat control.

(Continued from page 59)

ing to do in our dual-purpose schools.

In a school with a dual-purpose curriculum these students attend the same classes in English, social studies, and other liberal subjects and are distinguished from one another only by their choice of elective subjects. Rigorous courses in both mathematics and science definitely related to the technical work being studied is an integral part of the program. Consequently, students are not deferring their occupational program until they graduate, but add it as an extra measure to their high school education. Thus, they are well prepared for profitable employment in the field of their choice or for additional study on the post-secondary level in their chosen field. Frequently this is in an engineering college.

We believe that this type of a technical program is especially important today because the technological advances during the second half of the twentieth century frequently result in the elimination of unskilled jobs and their replacement by others requiring highly developed technical skills. This process is being speeded up by evolutionary developments in automation and atomic energy in this *outerspace* era, resulting in a lesser need for routine workers and an increasing necessity for people with the trained knowledge necessary to design, develop, and maintain nuclear powered machines.



Room No. 148. Metal Shop

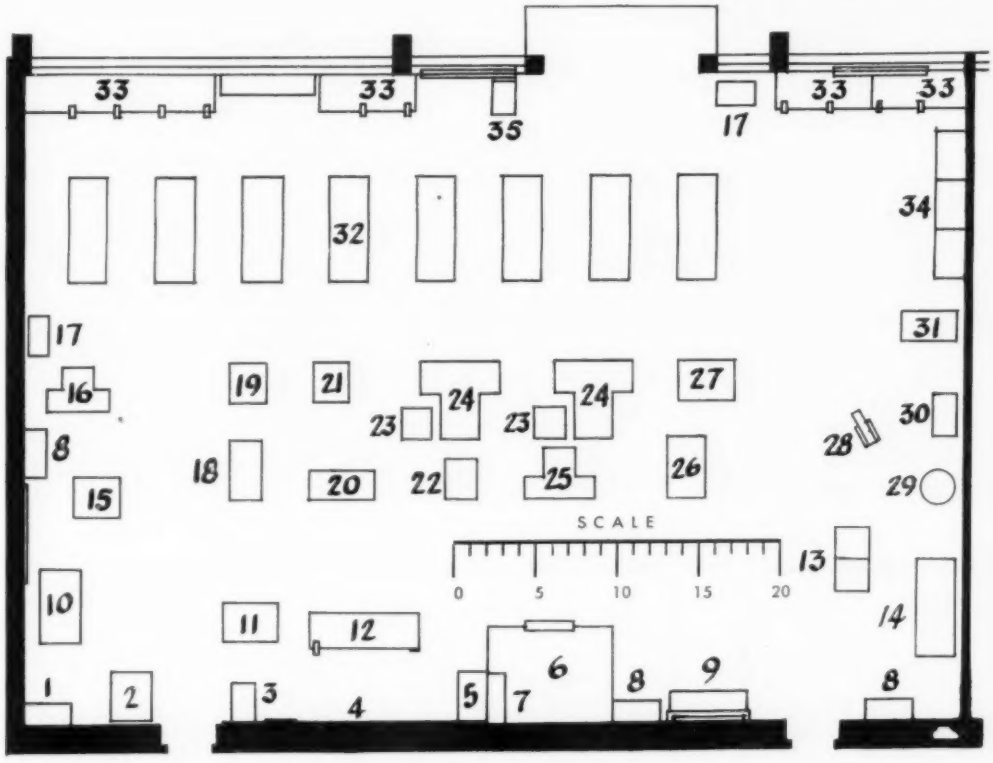
1. Metal spinning lathe; 2. grinder; 3. nibbler; 4. planishing hammer; 5. ring shear; 6. (4) benches; 7. drill grinder; 8. cornice break; 9. squeeze dimpler; 10. squeeze riveter; 11. storage; 12. (3) workbenches with lockers; 13. (2) squaring shear; 14. (2) drill presses; 15. slip-roll former; 16. box and pan brake; 17. Chicago std. brake; 18. belt surfacer; 19. disk finisher; 20. soldering bench; 21. revolving machine; 22. Do-all saw; 23. (2) benches with vise; 24. (2) bar folders; 25. Beverly shear; 26. Di-acro finger brake; 27. (2) anvils; 28. (3) gas welding booths; 29. electric welder; 30. heat-treat furnace; 31. spot welder; 32. punch press; 33. bender; 34. teacher's wardrobe; 35. toolboard; 36. hydraulic press; 37. fastener and rivet bin; 38. desk; 39. chalkboard; 40. power panel; 41. sink.

Experience has indicated that about 75 per cent of our technical graduates continue their education in schools of higher learning. Their success in engineering colleges has been outstanding. For example, of the 54 high school graduates from New York City who were on the honor roll at the Massachusetts Institute of Technology last spring, 10 were graduates of the Brooklyn Technical High School. For the last four years, of the 52 students from the Capital District (Albany, New York area) on the Dean's list at the Rensselaer Polytechnic Institute in Troy, 26, or exactly half, were graduates of technical courses similar to those offered in our community. Another fact of interest is that of the 19 graduates of the Mont Pleasant High School in Schenectady who entered Massachusetts Institute of Technology since 1944, 16 were graduates of the technical courses in that school. Not one of the technical high school graduates failed at M. I. T. In 1955 a Professor of Mechanical Engineering at M. I. T. wrote, "Every year, I hope a number of your graduates will come to M. I. T.; we need such students."

The length of the school day is longer than in our academic high school courses because 19 units are required for graduation in contrast to the 16 units required in academic high schools. (New York State requirements mandate a nine period day for both technical and vocational courses as contrasted with the usual eight period day.) Actually many of our graduates from our technical program will have 20 or more accredited units. Responsible authorities of the New York State Education Department have made it unmistakably clear that graduates from a technical high school have been accepted in engineering colleges and also a large number of liberal arts colleges.

In our professional judgment, students and their parents should have no misgivings whatsoever regarding this type of splendid training program for those who have the intellectual curiosity to pursue a math and science program enriched with technical training as well as shop laboratory work. It seems to us that school authorities have a patriotic responsibility to provide these courses for those who have the interest and ability to pursue such a program during the senior high school years. This realistic planning will mean much to our country during this critical period in our history when so much of our future is irrevocably tied up with the future development of mathematicians, scientists, and technicians.

It is well, therefore, to consider further developments in this important direction.



Room No. 149. Machine Shop

1. Storage; 2. Do-all saw; 3. power panel; 4. chalkboard; 5. teacher's wardrobe; 6. tool crib; 7. parts cabinet; 8. (3) storage cabinets; 9. sink; 10. Universal grinder; 11. desk; 12. demonstration table; 13. (2) quenching tanks; 14. furnace; 15. tool and cutter grinder; 16. surface grinder; 17. (2) grinder; 18. bench lathe; 19. light drill; 20 precision bench lathe; 21. precision drill; 22. precision bench mill; 23. (2) tool stands; 24. (2) milling machines; 25. turret mill; 26. shaper; 27. geared drill; 28. anvil; 29. forge; 30. grinder; 31. power hacksaw; 32. (8) lathes; 33. (4) benches with vises; 34. vertical bar rack; 35. arbor press.

New Facilities for Industrial Education at Woodstock Community High School

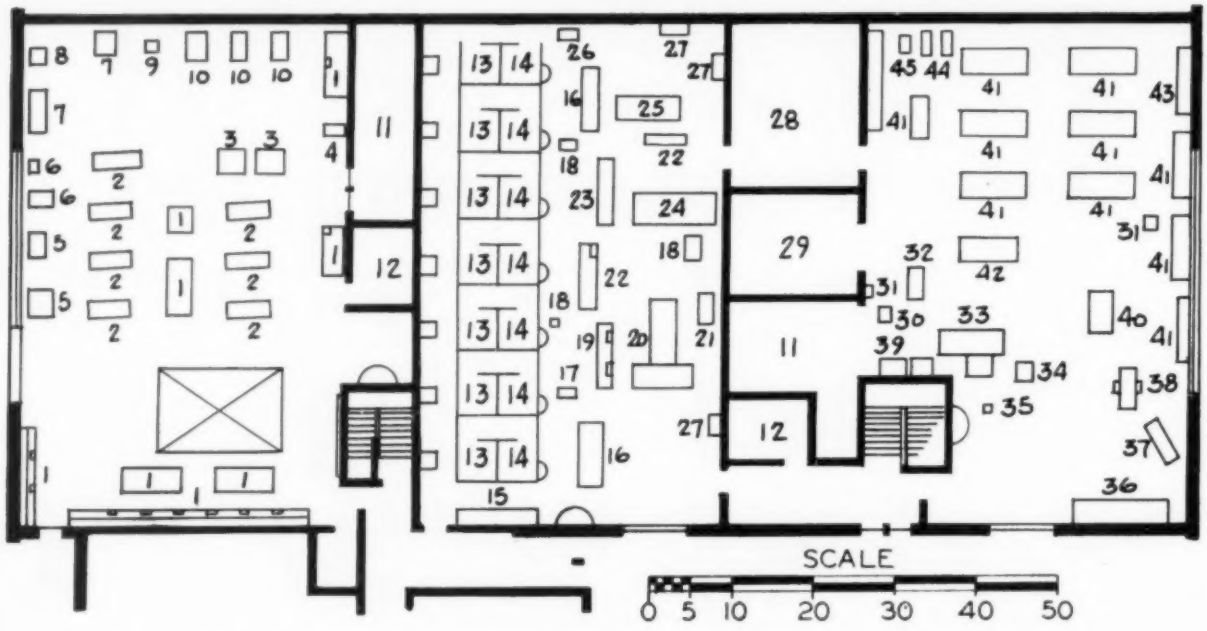
CLARENCE SPARKS
District No. 152
Woodstock, Ill.

On November 13, 1954 the people in the Woodstock community voted in favor of a building program for industrial and agricultural education at their high school. A brochure used at that time states: "The proposal is to build entirely adequate, substantial shops, at this time when we need good shops and need to make room for larger enrollments. Woodstock has been noted for a good shop program for years — this proposed building will provide adequate shop buildings for rural and city students, as well as for the adult evening program."

Before this brochure was distributed, many hours of discussion and planning had taken place. Various groups, the board and administration, departmental staff members, lay committees, representatives of the state office, and the architect's staff, participated in these discussion and planning meetings. While there was room for improvement in this co-operative effort, it was certainly a step in the right direction for any successful building program. The results

Fig. 1

Fig. 2



First floor. At the left hand is the machine shop. Room 11 is for storage, and at 12 is the office. The center shop is for welding and sheet-metal work. Room 28 is a classroom, and 29 is the finishing room. The shop at the right end is for woodworking

First Floor

1. (8) Benches; 2. (7) lathes; 3. (2) small lathes; 4. saw; 5. (2) grinders; 6. (2) milling machines; 7. (2) large drill presses; 8. furnace; 9. small drill press; 10. (3) shapers; 11. storage; 12. office; 13. (7) arc welding booths; 14. (7) gas welding booths; 15. rack; 16. (2) vise tables; 17. hack saw; 18. (3) shears; 19. (2) forming machines; 20. workbench; 21. solder table; 22. brake; 23. stake table; 24. layout table; 25. press table; 26. grinder; 27. (3) storage cabinets; 28. classroom; 29. finishing room; 30. band saw; 31. drill press; 32. glue table; 33. radial saw; 34. planer; 35. grinder; 36. project storage cabinet; 37. lathe; 38. jointer; 39. storage cabinet; 40. saw; 41. (10) workbenches; 42. assembly bench; 43. tool cabinet; 44. (2) jig saws; 45. sander.

of our efforts are described in the materials presented in this article.

The final and approved plans were for a building of 27,000 square feet of floor space, to house the agricultural department, the industrial education department, and the art and crafts department. The shop building was located at the back of the main building. While there is no structural connection to the main building, consideration was given in the location for the possibility of connecting the shop building with any future expansion of the main building. The floor plans show the shape, sizes,

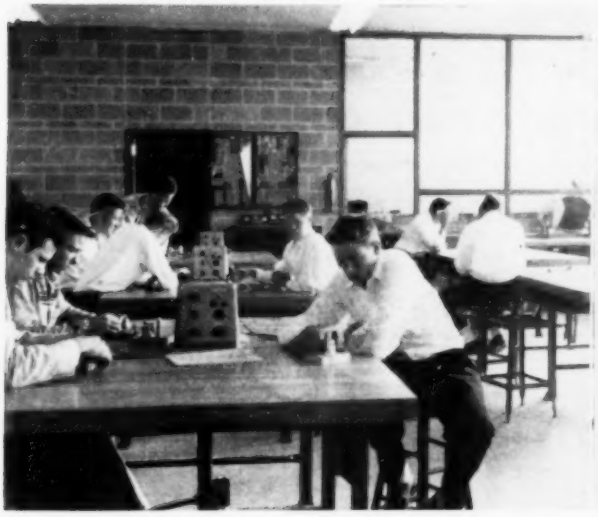


Fig. 3

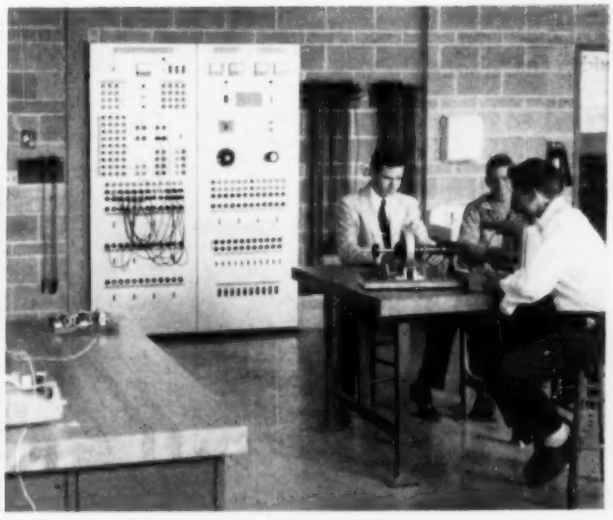
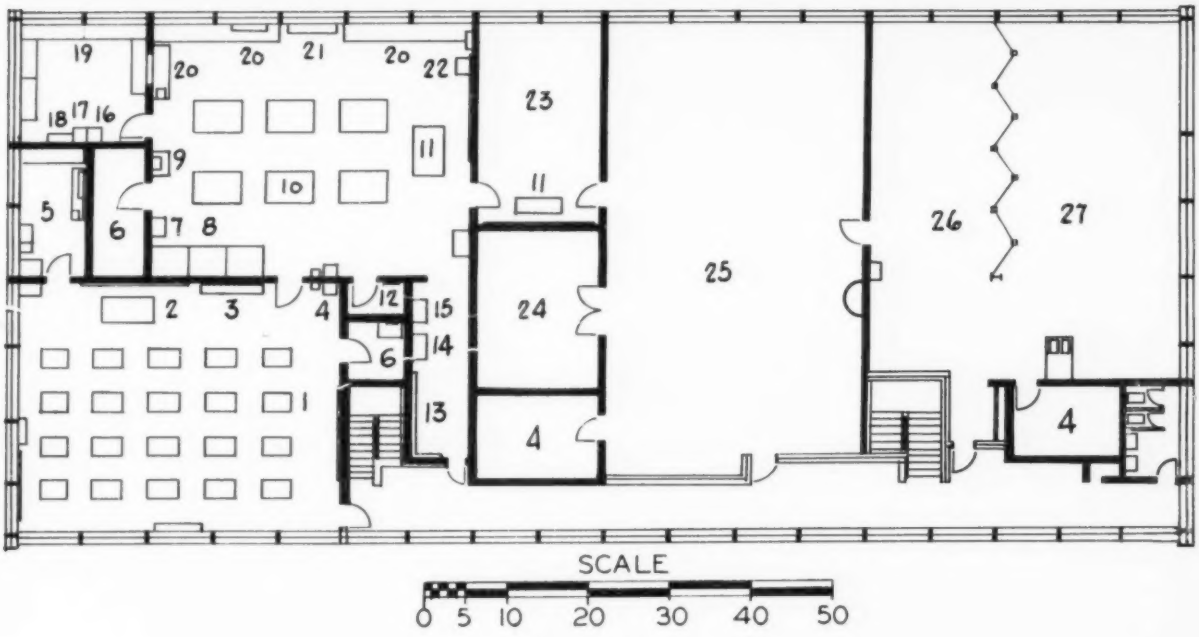


Fig. 4



Second Floor

1. (20) drafting tables; 2. instructor's table; 3. storage; 4. wash basin; 5. office and printing; 6. storage; 7. drill press; 8. (3) wiring booths; 9. parts supply storage and tool panels; 10. (6) workbenches; 11. demonstration table; 12. voltage distribution; 13. clothing hangars; 14. instructor's locker; 15. demonstration storage (on wheels); 16. instructor's desk; 17. file; 18. bookcase; 19. electronics test benches; 20. electrical test benches; 21. (2) tool panels; 22. drill press; 23. classroom; 24. finishing room; 25. shop (future needs); 26. handicrafts; 27. art.

etc., of the various parts of the plan. (The agricultural shop and classrooms, which are in a separate wing of the building, are not shown or described in this article.)

Some of the Better Features of the Building

Excellent lighting is available through an abundance of window (tinted) area and by adequate artificial lights. Although there are variations in the height of the windows above the floor, most are 4 ft. 6 in. This gives room for benches and machines, and also provides 7 ft. of window space below the ceilings. Windows fill most of the spaces between the I-beam framework, which is on 8-ft. centers. Work and storage areas are in general quite satisfactory. However, there are exceptions, some of which were caused by necessary architectural and engineering changes after the building was in progress, and others were caused by the "law of limitations." The classrooms between two shops on each floor are well worth the space used. While their size (16 by 24 ft.) might seem small, twenty large arm-desk chairs can be put into them with

ease. These rooms serve adequately for discussion, study, demonstration, visual aids, and library reference purposes. The testing laboratory in the electrical shop is adequate in size (16 by 16 ft.) and the partition separating it from the main shop area is all glass from 3 ft. above the floor. The finishing rooms, while not excessive in size, serve their purpose well and they are ventilated through ducts to the roof. While each instructor has his regular work desk, table, or stand, in the shops proper, there are, in most cases, spaces for desks in smaller rooms adjacent to the shops. This arrangement provides the necessary privacy for records, professional literature, etc. We have found, also, that these small rooms can be heated more easily for any work that is necessary during "after hours." Even a small circulating electric heater can serve when the heating plant doesn't have steam up.

Power for equipment is laid in the floor and in channel ducts around the walls. There are safety circuit breakers in all shops and auxiliary rooms where there is any danger to students. The first floor is heated by forced air through an extensive network of tile running through the concrete floor. This serves to keep the floor warm, a welcome feature in cast flooring. However, the large blower units for distributing the heat do require considerable space in the various rooms. At present we have not ascertained the over-all effectiveness of the heating system.

Some Suggestions for Those Who Are Planning Buildings

The accompanying cuts and plans can show other good, as well as bad, qualities. However, a few thoughts might be passed along to those who might now or someday be planning similar facilities. While we have an outstanding building, we made the mistake that we had allowed no provisions in our bond issue for equipment. The reasons were: (*a*) some of the old shops had a large amount of fair equipment; (*b*) we had several thousand dollars that would be available from the regular funds; and (*c*) the general consensus of the planners was, "Get an adequate building and let the equipment come later."

This seemed like good thinking then, and it still does. It is good theory, but it is usually poor practice. Just like so much practice is poor simply because we forget the theoretical principles when we start to practice. In cases like this, the usual results are these: The school board has a change in membership; there are administrative and staff changes; all other departments begin clamoring for equipment; and, finally, the "large amount of fair equipment" is doomed for another twenty-five years of service.

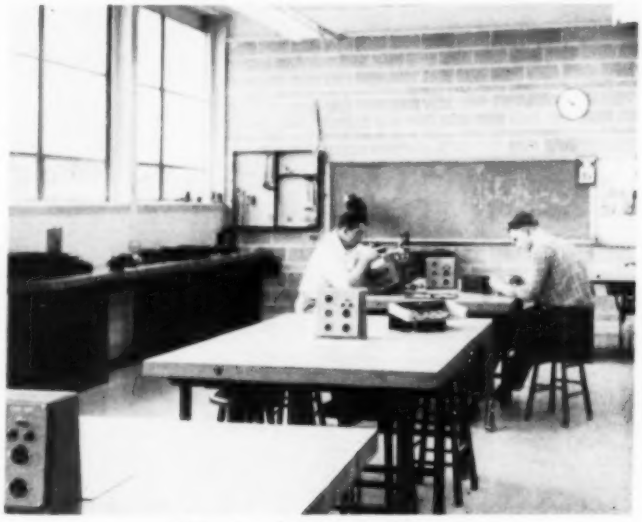


Fig. 5. An Electrical Shop

The wise procedure when planning a new shop building would be to take time from the main issue of building planning to adequately inventory and evaluate the equipment in use. Any equipment that is necessary for new facilities should then be provided for in the bond issue.

Another error that is often made during a building program is to attempt to *break ground* the day after the votes are counted. Too often the new building has been a dream for so long that staff members have quit planning seriously because *talk* never quite materialized into anything concrete. Then suddenly the action catches them unawares. It takes a lot of planning to do a good job. We would all do well to give ourselves two or three months more time for that superior job, especially since we have perhaps been waiting years for that *new building* to become more than a dream. We need to give ourselves more time between the voting and the bidding to get those hundred-and-one last-minute problems worked out.

It is hoped that the preceding remarks have not led anyone to think that we made more than our share of mistakes. Far from it. All the people directly concerned worked hard and well together. Consequently, they have obtained results of which they have every right to be proud. It is just that our *hindsight* can become someone elses *foresight*. Happy planning!

NATO (North Atlantic Treaty Organization) is a voluntary association of 15 nations of the free world banded together to protect themselves against Communist aggression. They are: the United States, Great Britain, Canada, France, Belgium, The Netherlands, Denmark, Portugal, Italy, Iceland, Luxembourg, Norway, Greece, Turkey, and the Federal Republic of Germany. — *Wisconsin Military District Information Office.*

Money made of steel is back in the news because of an order for stainless steel coins placed by a Central American government. The order is for 12 tons of stainless to be struck into 500,000 coins of small denomination. — *Steel Facts.*

IMPURE WATER IN AN AUTOMOTIVE BATTERY IS EXPENSIVE

FRANK P. PLOVICK
Field Service Manager
Delco-Remy Division
General Motors Corporation
Anderson, Ind.

Using well or city water in a storage battery may cause failures. Only the purest water available should be used. Whenever possible, use only distilled water or demineralized water.

Continued use of water containing common minerals such as iron or manganese can ruin a battery in a very short time. Even in cities where water is essentially mineral-free and has been approved for battery use, the car owner should let water run from the tap for a considerable period before collecting water for battery use. Water originally mineral-free may absorb iron or other impurities injurious to the battery after standing in household plumbing.

It may take a little more trouble to get pure water, but the extra time spent will pay off in longer battery service life.

The Spokane Technical and Vocational School

KENNETH ERTEL
Co-ordinator, Distributive Education
Spokane, Wash.

"We have long given recognition to the needs of students in the realm of general education. The 'social competencies' developed in this program are vital to the student and they are of paramount importance to our democratic society. But in addition to these social competencies, our boys and girls need a salable skill. They require 'beginning competency' in business and industry.

"In our society 'beginning competency' has come to mean training in a specific trade or vocation, in addition to a solid foundation in the field of general education. Without specific training, our graduates can be the victims of technological unemployment in the face of a crying need for workers in our expanding economy. The community looks to the post high school Technical and Vocational school to prevent such a catastrophe.

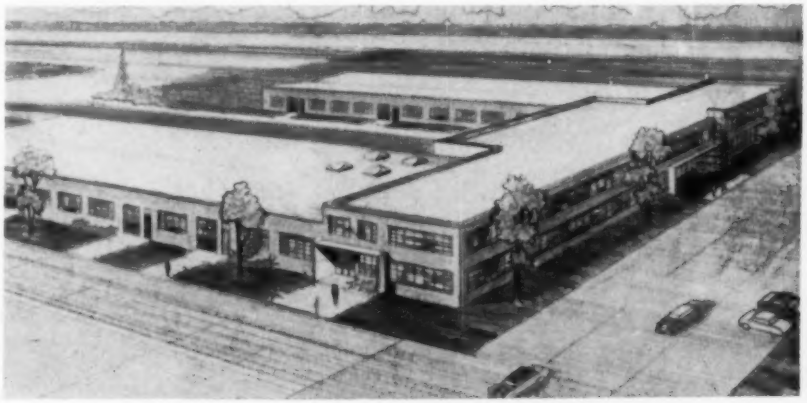
"In addition to the function the vocational schools have in establishing 'beginning competencies,' they have a further function. Our society is dynamic. Our technology is undergoing change at an unprecedented rate. Adult workers in the community need the services of our Technical and Vocational schools to reinforce and modify the skills required as technological changes occur in trade and industry.

"Spokane is a growing city, a city growing in industry as well as population; our Technical and Vocational School is geared to meet the needs of expanded industry in training skilled personnel in all areas."

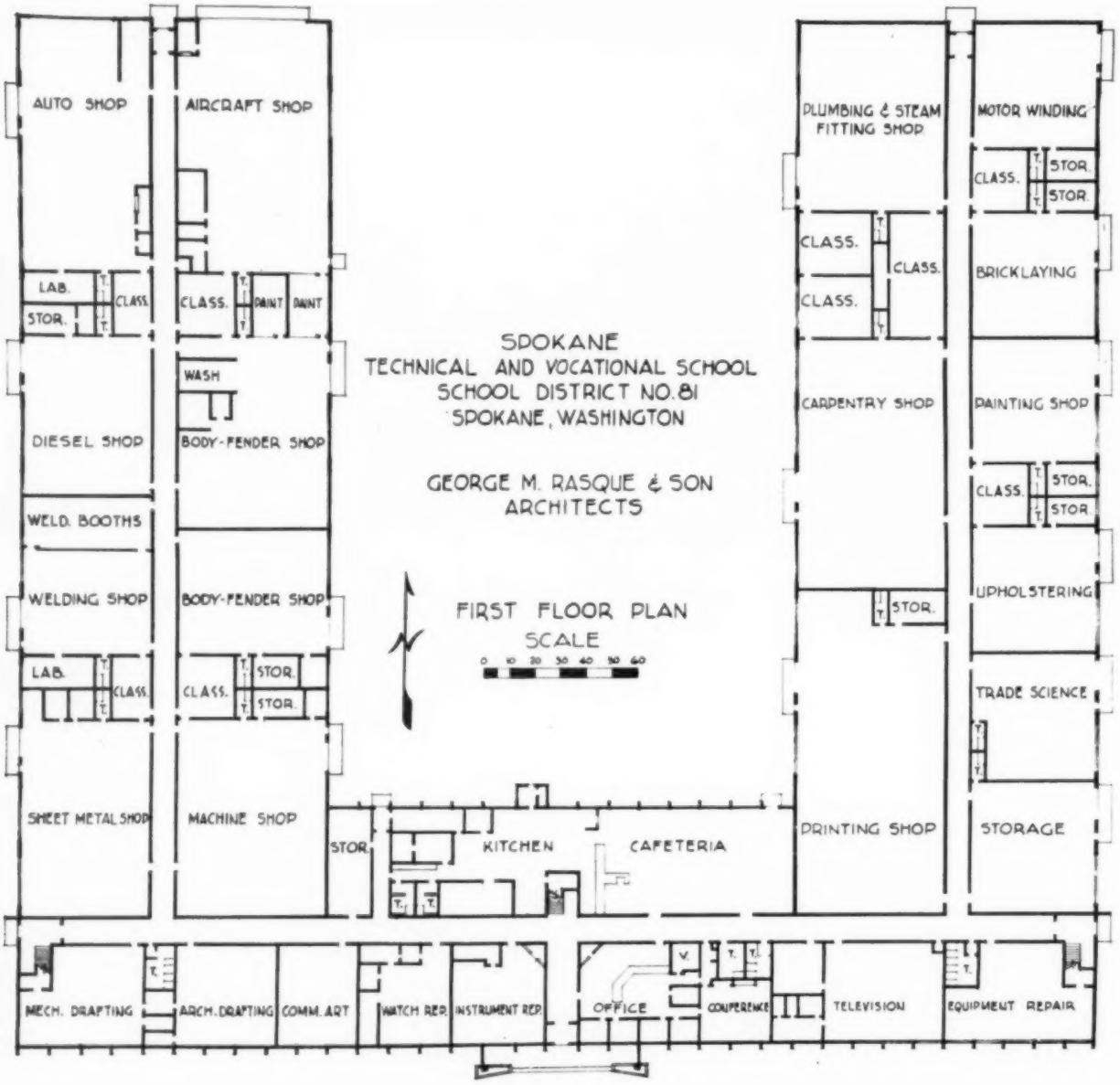
This is part of the philosophy of Spokane Public Schools as stated by our Superintendent William C. Sorenson.

With this philosophy in mind, Spokane is moving forward with the completion of its new 52-unit technical and vocational school. The eight shops of

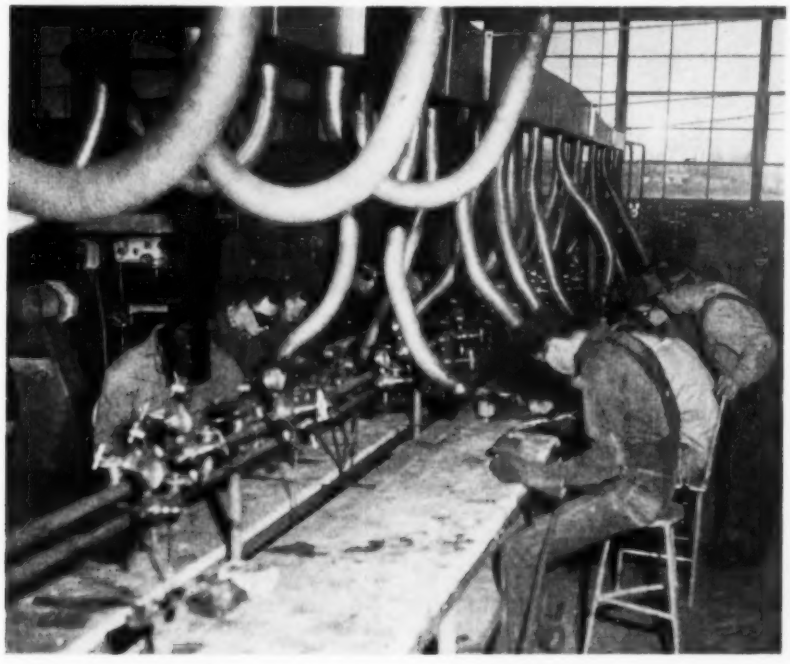
Students at work on machine tooling projects in the machine shop. The equipment includes eleven lathes (18 in., to 10 in., with up to a 5-ft. bed); four milling machines; two surface and one cylindrical grinders; one shaper; five drill presses, including one radial drill; three heat-treating furnaces; one tool and cutter grinder; one turret lathe, and one punch press



Architect's conception of the completed Spokane Technical and Vocational School. Total cost is $1,315,000. Equipment is $1,000,000



Costs on the Spokane Technical and Vocational School building are $9.56 per square foot (137,540 square feet). Total cost is $1,315,000. The west wing was completed in September, 1956. The south wing, under construction, is to be finished by September, 1958. The east wing is in the hands of the architect.



Students are welding various joints on the 14-station oxyacetylene welding bench. Each 4-ft. station has individual exhausts. The centered oxygen and acetylene manifolds keep the table free of hoses and valves

the west wing began operation in September, 1956. Classes will open in the south unit in September, 1958.

This vocational school is not a recent innovation in the Spokane education program. The first vocational printing classes operated in a Spokane high school in 1922. By 1935 vocational night school classes were operating at North Central High School under the direction of our present principal, E. J. Griffin. In 1941 the old Hawthorne Elementary School was remodeled and the Trade School moved its 180 students downtown to carry on its expanded wartime training program.

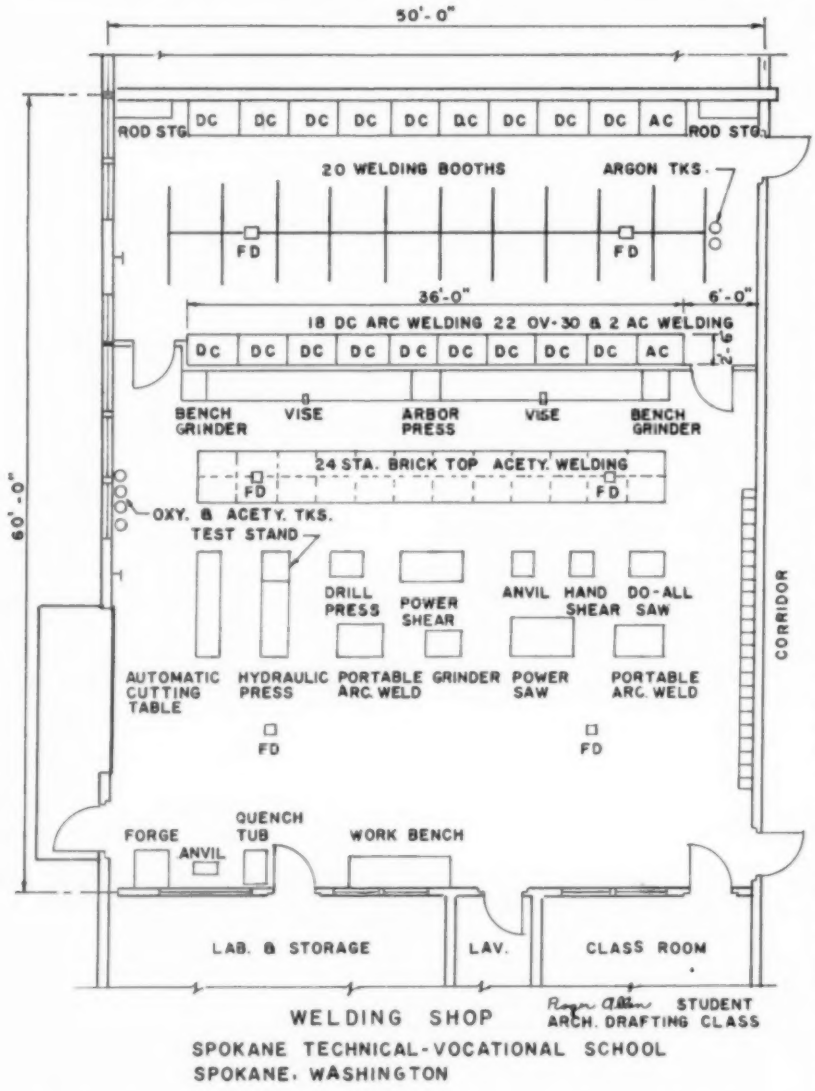
The first bond issue on our present building program was passed in 1952 when $250,000 was pinpointed for vocational education. This, plus the $200,000 bond issue in 1954, enabled the purchase of the four and one-half city blocks at Mission and Ferrall and the completion of our eight-shop west wing. Two months after the completion of the heavy shop area, the Spokane voters earmarked another $1,000,000 for completion of the vocational school plant. This $1,000,000 was a part of the eight-million-dollar school bond issue which passed by an 85 per cent majority with the largest school vote ever recorded here.

Special Features

The following list points out some of the important building features which may or may not appear in the accompanying sketches and photographs:

1. Exterior walls of reinforced concrete with cork insulation under plaster.
2. Finished floors of asphalt and ceramic tile laid on concrete slabs.
3. Second floor and roof slabs of vermiculite concrete supported on steel joists.
4. All ceiling construction with one (1) hour fire rating.
5. Ceiling finish of acoustical tile.
6. All exterior entrances of metal.
7. Sun control by aluminum louvers on south exposure.
8. Large shop areas with no obstructions and clear roof span. Large overhead doors in each shop plus 40-foot hangar-type door in Aircraft.
9. Each shop with its own complete self-contained heating unit.
10. Shielded walls, ceilings and floors in electronics, radio and television calibration rooms. (Shielding is under cover in finish work and cannot be visually detected.)
11. Kitchen area used for cooking, as a lunch program, and as a training area for cooking, baking, and restaurant training programs.
12. Heavy mechanical shops all in the west wing. Building trades all planned for east wing. Diversified technical training and offices in center section.
13. Easy access for large equipment in each shop.
14. Centralized storage and distribution center.

Students at work in the airframe fabric and dope section of Aircraft and Engine Mechanics course. All projects are live and will be flown. Students become eligible for CAA (Civil Aeronautics Administration) Airframe and Engine Mechanics licenses. The shop is 60 ft. by 96 ft., with no pillars or obstructions. Locked tool and stock storage is available



Detailed floor plan of the Heli-Arc, arc, and oxyacetylene welding shops and related classroom. This floor plan is an architectural drafting class student project.

15. Related classrooms adjacent to all shops.
16. Each shop provided with individual toilet facilities.
17. Adequate lighted and paved parking areas for students' cars.
18. Central office location.
19. Cafeteria convertible to auditorium.
20. Automatic dial telephone communication to each room.
21. Corridors with ceramic tile wainscot for ease in maintenance.
22. Liquid oxygen used in oxygen and acetylene welding shops.

Each instructor had the major responsibility in the detailed planning of his own shop area. Advisory committees, made up of representatives from labor, management, and the school, were consulted in each section. As far as it was structurally and economically feasible, the architects followed these plans.

In the over-all planning, the building trades classes were arranged for the east wing; the diversified technical training classes and offices for the south wing, and the heavy mechanical shops were placed in the west wing.

In the arc welding section there are 20 training stations. Each four-foot-square station is individually isolated and lighted with a welding machine available immediately behind each booth. The department has an overhead exhaust canopy reaching from the outer edge of each booth to a center exhaust duct.

The welding instructor, Rowland D. Johnson, who designed this system said, "This is the best welding booth arrangement I have ever used in 41 years of welding experience."

The shop air is completely changed every three minutes by these ventilation and exhaust systems. The department has two full-time and one part-time welding instructors. At the present time, there are 48 students enrolled and 25 on a waiting list for enrollment in welding. During the school year 1956–57, after the west wing was opened, 337 students satisfactorily completed welding proficiency exams in both the day and night programs.

In the acetylene welding department there is a 24-station table 36 feet by 5 feet with liquid oxygen and acetylene manifolds mounted down the center of the table. Each station is four feet wide. There is an overhead exhaust outlet at each station which is controlled individually by a flexible aluminum tube. The table is designed so that the hoses are brought up from below through the center gutter to regulators, thus protecting them from fire and damage.

The machine shop has practically daylight conditions from translucent plastic ceiling domes which eliminate shadows on work. The equipment is departmentalized by type of machine. Steel racks are conveniently located by power hack saws for ease in cutting stock. There are Hallowell and Burger steel shelving and cabinets for tool storage.

The radio and television alignment rooms in the south wing have complete copper shielding to eliminate outside electrical impulses. The shielding is continuous through the floors, ceilings, and walls. The light fixtures, switch boxes, and all other equipment have been set back into the walls and ceilings and shielded. The television workbenches have been constructed with moveable dollies that swing into work position for greater convenience in moving, handling, and positioning of the chassis. Each student will have complete commercial test equipment as it is used in a modern repair shop. Radio, radar, and computer mock-ups will have a room that provides for quick selection of any circuit under discussion. Radio and radar transmitting and receiving rooms are provided with a complete patch panel to select proper combinations of antenna length and impedance. Each instructor has a small work space adjacent to his office to be used for the purpose of setting up special demonstration circuits. All shops have been planned to

handle new electronic developments as they occur in industry.

The Diesel and heavy duty mechanics shop has all heavy mock-ups mounted for ease of handling with suitable hoisting equipment. It has a stationary overhead *A* frame above the oakite degreasing tanks. Tools are kept on peg board storage in the class supply room and are dispensed on a student check-out basis. Gas and diesel engine rebuilding, troubleshooting, design and fuel injection systems are taught in this program.

The kitchen and cafeteria area is designed much larger than a school lunch program would demand. The kitchen is to serve as a classroom for cooking, baking, waitress training, and hotel and restaurant management. The cafeteria is convertible into an auditorium.

The practical nursing school has a complete replica of a hospital ward and treatment room for clinical practice. It has a modern kitchen to be used as a nutrition laboratory. The section includes a lecture room, private offices, storage, lockers, and rest rooms. Clinical experience is obtained at Deaconess and St. Luke's hospitals. The program lasts 13 months with one semester in the vocational school and eight months of ward experience in the hospital.

At the present time, there are 448 students enrolled in the full-time program at the Spokane Technical and Vocational school. All classes are operated with the help and advice of advisory committees. Classes in operation are:

Office Practice and Procedure
Typing
Shorthand
Bookkeeping
Terminology
Printing
Auto Mechanics (Electrical)
Body and Fender Work, and Body and Fender Painting
Drafting
Basic Radio
Watchmaking and Related Jewelry Repair
Auto Mechanics
Sheet Metal
Aircraft and Aircraft Engines
Arc Welding
Acetylene Welding
Advanced Radio
Machine Shop
Television
Auto Mechanics (Carburetion)
Diesel
Instrument Repair
Practical Nursing
Distributive Education

Salpointe High School

HERMAN R. BERLOWE
Tucson, Ariz.

When the beautiful, new Gercke School of Vocational Arts was dedicated in Tucson, Ariz., a speaker at the ceremonies predicted as he looked northward to the purplish, towering Catalina mountains, that this addition to Salpointe High School marked the "beginning of a new era in Catholic instruction and leadership in Tucson."

And, as the venerable Bishop D. J. Gercke, for whom the vocational institution was named, accepted the keys from Louis J. Felix, chairman of the school's board of trustees, he said: "I certainly appreciate the honor bestowed upon us today and humbly accept this grace in His name."

Thus, there came into being a vocational school for Salpointe High, the only Catholic high school in Tucson. Yet, there was more to it than just the dedication. For the Gercke School, built of cream-colored brick, and roofed with red tiles, is a reality only through the heart-warming generosity of Mrs. Helena S. Corcoran, who came to live in Tucson and grew to love the great southwest. It was Mrs. Corcoran who saw the need for supplementing Salpointe's admirable fine art and religious curricula with a vocational program second to none. And putting her thought into action, she provided the Carmelite school with funds that made possible the Gercke School, its splendid equipment, and competent staff.

The vocational school consists of a graphic arts department, small as yet but growing — a drafting department, electricity shop, woodwork shop, and a general metals department consisting of welding, sheet metal, and machine shops. Included, too, is a very extensive homemaking, commerical, and art program. The entire vocational setup is housed in the northeast wing, the eastern part of an attractive patio.

The photography department, although small, is compact, neat, and well equipped. It contains, among its supplies, a Federal 4 by 5 enlarger, Omega Lite D-2, Recordak Model A, several printers, two K20 aerial cameras, two press cameras, and a view camera with a 19-in. lens. The students also do photostat, goldtone, and microscopic

Print shop

Drafting room

work, and are even experimenting with recovering old prints.

The printing department in a 25 by 40-ft. room, has 24 students in two classes, beginning and advanced. For equipment, there are 10 by 15 and 8 by 12 platen presses, a Little Giant cylinder press, a proof press, three hand presses, and nine cabinets of type providing 24 working stations. Type, mostly Century and Spartan, is available up to 72 point. Block printing and silk screen work are also taught. Air-cooling and heating system is provided through five overhead circular ducts. There are 10 large cabinets in one corner for storage space, the cabinets measuring 3 ft. high, 2 ft. wide, and 3 ft. deep. This department, while adequate now, will probably require expansion in the near future as the popularity of graphic arts grows.

The electricity department has a 60 by 25-ft. room, and was begun just this year with two classes of 24 students. There is a small storage room, a 4 by 12-ft. wire-enclosed toolroom with tools neatly stacked on wall racks. Four chalkboards, two each on two of the walls, round out the shop's layout.

The drafting room, in operation for a longer period, appears somewhat crowded with 36 all-metal drafting tables in a 60 by 45-ft. room. Student work kits are kept in wall cabinets. In an 8 by 14-ft. room is kept additional equipment such as duplicating materials, a mimeo, a filmstrip projector, and a drafting machine. The drafting room itself is a large one in comparison with other departments, measuring 60 by 45 ft., with tiled floors and five overhead cooling vents.

The woodworking room occupies a space 60 by 60 ft., to accommodate 28 students. It has separate tool and spray rooms, and its equipment includes a wood shaper, table saw, joiner, mortiser, drill press, surfacer, an exhaust system, disk sander, spindle sander, band saw, two lathes, tool grinder, and jig saw. There is a small office, and the large windows in the room face north permitting plenty of natural light. There is also a 15 by 10-ft. finishing room. The woodworking shop is the final *unit* shop; the remainder are all located in one huge room.

In this single room, somewhat larger than the woodworking shop, are the general metals classes — welding, sheet metal, and machine shop. The welding department occupies one far corner along the west wall with eight stations, four for arc welding, and four for oxyacetylene gas. There are two d.c. and two a.c. generators. This department has its own acetylene generator resting behind reinforced, thick walls. A soft metal foundry adjoins the arc welding units, along with two furnaces.

The machine shop is in the center of the room, which has no ceiling immediately overhead. Much of its best equipment has been just recently acquired. Here may be found six metal lathes, a 13-in. Regal lathe, two power hack saws, four pedestal grinders, metal-cutting band saw, surface grinder with magnetic chuck, 7-in. metal shaper, 13-in. shaper, and a universal milling machine. There is an 8 by 8-ft. tool room in a corner cage, and nearby are a combination bender, Beverly shears, and a drill press.

The sheet-metal shop is the third part of the general metals. Here are a 20-ft. long soldering table, eight vises, and every type of stake in use. Perched on the east wall are a 36-in. box and pan brake, a 36-in. groover, a combination circle shears, a small sheet-metal nibbler, two buffers, three sheet-metal tables, squaring shears, bar folder, three combination turning-burring and crimping machines, double seamer, a setting-down machine, and a slip roll former. Locker space for 75 students and ample storage complete the facilities of this three-department unit. There are two classes of 24 each taking general metals.

Such is the composition of the vocational department of Tucson's only Catholic high school. Because the industrial-arts program has been in existence such a short time, no advanced classes are listed, but in time they will come. Plans for the future include a unit sheet-metal shop and a unit machine shop. The high school is headed by soft-spoken, bespectacled Father Bonaventure Gilmore, O.Carm., and the shops are under the supervision of Daniel C. Blide, who came to Salpointe after 37 years of teaching and administrative work at North Dakota State Teachers College, where he headed the industrial-arts department and was dean of men. He has two assistants.

Everything at the Gercke School of Vocational Arts is still in its infancy, to be sure, but the promise it holds for the fortunate students is untold.

Machine shop

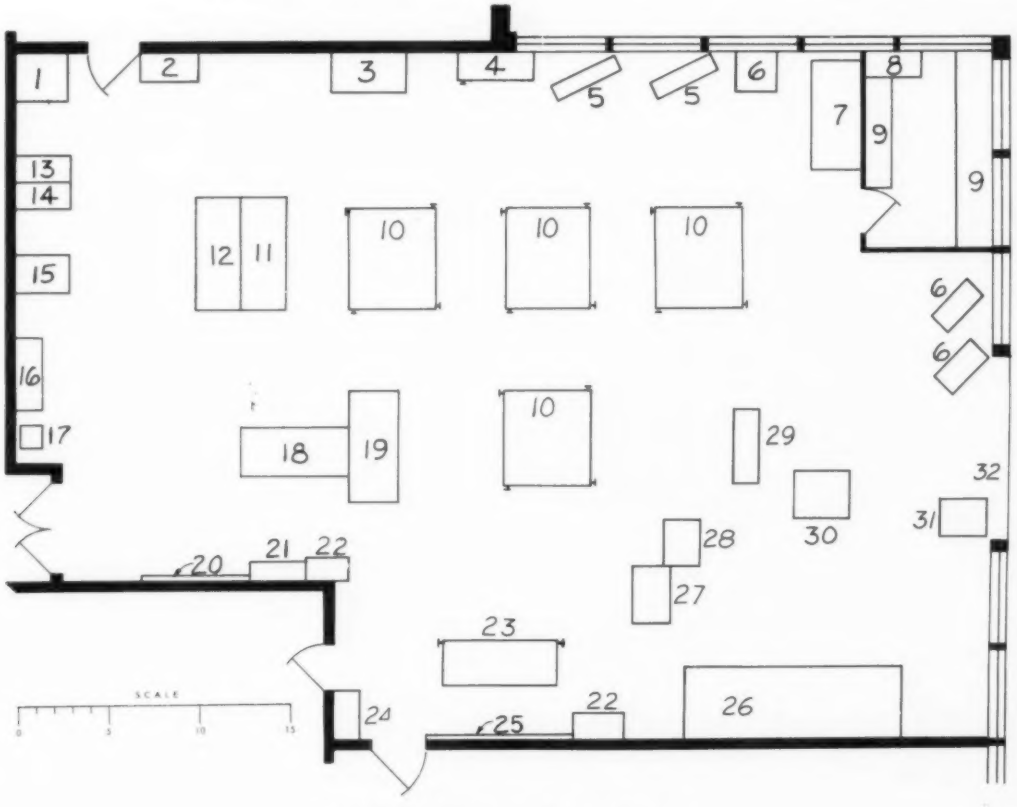
Physical Features of the Shops

CHARLES E. EASTERBROOK
Industrial Arts Instructor
Thomas A. Edison Junior-Senior
High School
Elmira Heights, N. Y.

The floor of the woodworking shop is ⅛-in., vinyl tile laid over concrete. The floor of the metalworking shop is concrete sealed. Ceilings, 11 ft. above the floor, are covered with acoustical tile. Walls are of painted cinder block. Windows with sills 3 ft. above the floor extend to the ceiling. The three top panes are translucent glass tinted blue. The next two panes are Solex glass and the bottom pane is clear glass. Heat *is* provided by radiation under all windows and by continuously circulating air heated or tempered with outside air as necessary.

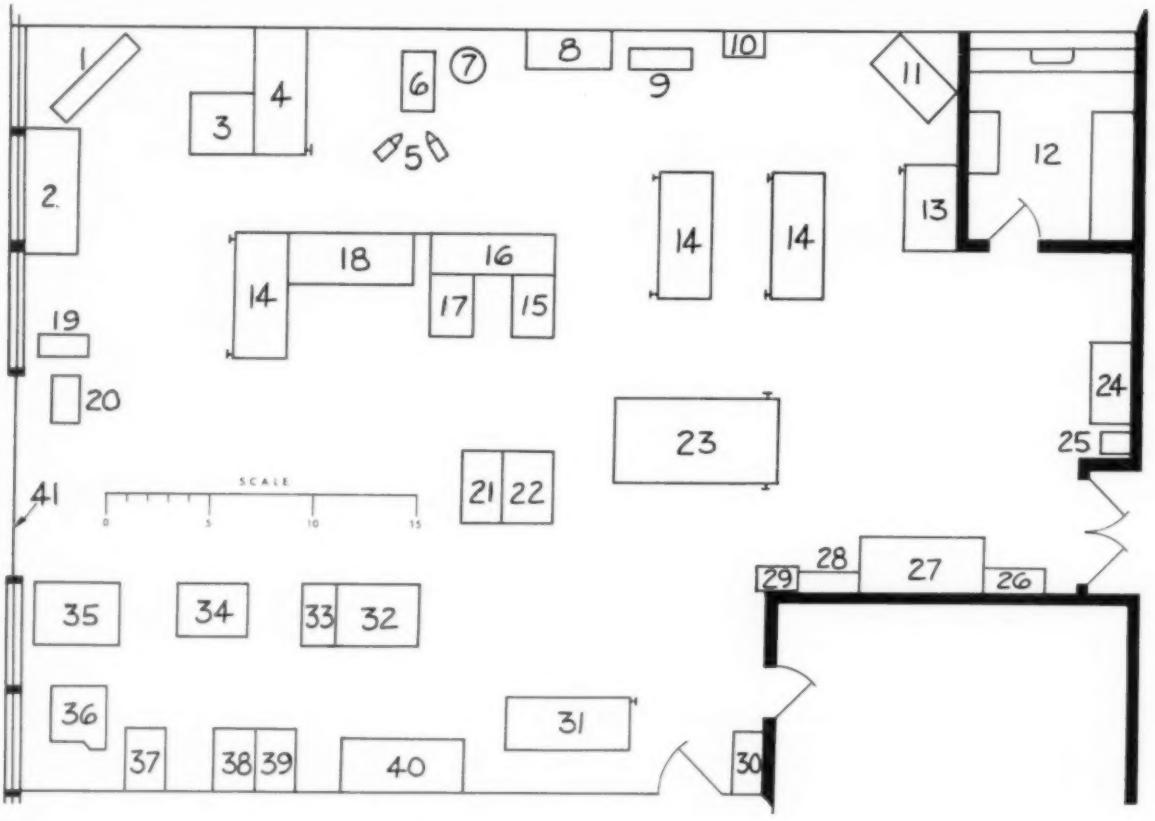
Lighting is provided by rapid start fluorescent lights. Natural gas is provided in each shop as well as compressed air at 70-lb. pressure. Electrical service consists of 120-volt outlets every 10 ft., along the wall 3 ft. above the floor, and 480-volt three-phase service in ducts under the floor. These ducts run across the width of each shop on 5-ft. centers and terminate in a duct which returns to the electrical service panel.

Future additions or changes in machine locations may be made by cutting



Wood, Ceramics, and Textile Shop

1. Kiln; 2. display; 3. tool cabinet; 4. tool repair; 5. wood lathe; 6. jig saw; 7. glue and stain bench; 8. storage; 9. finishing bench; 10. workbench; 11. workbench; 12. ceramics; 13. drying cabinet; 14. damp cabinet; 15. potter's wheel; 16. sink; 17. drinking fountain; 18. planing table; 19. textiles; 20. tackboard; 21. library; 22. file; 23. demonstration bench; 24. teacher's cabinet; 25. chalkboard; 26. lumber storage; 27. band saw; 28. planer; 29. jointer; 30. circular saw; 31. drill press; 32. overhead door.



Metal, Printing, and Electricity Shops

1. Spinning lathe; 2. finishing; 3. arc welding; 4. soldering; 5. anvils; 6. forge; 7. melting pot; 8. founding; 9. buffer; 10. hack saw; 11. tools; 12. darkroom; 13. art-metal bench; 14. workbench; 15. shaper; 16. machine lathe; 17. mill; 18. machine lathes; 19. drill press; 20. grinder; 21. pan brake; 22. squaring shears; 23. sheet-metal bench; 24. sink; 25. drinking fountain; 26. display; 27. planning table; 28. library; 29. file; 30. teacher's locker; 31. demonstration bench; 32. storage; 33. pan brake; 34. stone; 35. drying rack; 36. press; 37. pony; 38. type; 39. cabinet; 40. bookbinding; 41. overhead door.

into this duct, installing an outlet box and running necessary wires. Machines are connected to these boxes with heavy duty twist lock plugs and heavy rubber covered cable. This allows change of position of the machine without change in electrical wiring. The 480-volt service is provided with a system ground as is the 120-volt service which effectively eliminates the possibility of shock should a bare wire touch the frame of a machine. The 480-volt service is further provided with a magnetic contactor which is controlled by one locking switch and four emergency stop stations spaced around the room.

The shops are equipped to handle 16 to 18 students and serve a junior-senior high school of about 800 students. The courses offered generally include general woodwork, general metalwork, general shop for grades 9–12, and general shop for grades 7 and 8. Mechanical drawing is taught in an adjoining room 26 ft. by 28 ft., equipped with 24 desks and storage facilities. Mechanical drawing I and II are taught.

Storage facilities for the shops consist of a common storeroom 15 ft. by 18 ft., which serves for the storage of supplies except lumber, which is stored in the shop. The hall side of the storeroom is provided with a display case 30 in. deep, 3 ft. high, and 17 ft. long.

A USE FOR OLD PICTURE FRAMES

Old picture frames may be made into wall shadow boxes to display collector's items. These displays cover a wide range of items from hand painted porcelain mugs to bright colored stones.

The wood of the frame should be sanded down to the clean grain and covered with a thinned coat of fresh, white shellac. The shellac coat dries quickly and should be followed by another.

As a back base for the frame, plywood may be used. To display the items, suitable shelves must be fitted, and the plywood and shelves should be protected by thinned coats of pure, white shellac.

A unique coffee table also can be made, from a large enough frame. With the addition of a leg at each corner, a base and a glass top, the frame becomes a horizontal housing for the collection. Again, the wood should be properly sanded and coated with shellac. If the frame is not deep enough to allow the items to be placed under the glass, the base can be recessed to gain the necessary height. — *Shellac Information Bureau.*

If all rural highways and roads and city streets in the United States were laid end to end, they would circle the globe at the equator 135 times. — *Petroleum Newsnotes.*

Graphic Arts Area in the New Baghdad Technical Institute

SAMUEL E. RUSSELL*
Assistant Director
Vocational-Technical Institute
Florida Agricultural and Mechanical University
Tallahassee, Fla.

In order to meet the needs of the printing industry in Iraq and in order to further develop the new Baghdad Technical Institute, a graphic-arts program and a shop were developed as an integral part of the school. Planning the graphic-arts area, as well as planning the Institute, was done through a cooperative arrangement by the United States Foreign Operations Administration and the Iraq Ministry of Education.

The term *graphic arts* in this instance was used in its broadest sense.

The graphic-arts area was planned for a 49 student maximum with adequate tolerance for expansion. The area is housed in a separate building which is located nearest the administrative and classroom area on the campus. It contains 4982 square feet of floor space, or 102 square feet per student. All tables and other furniture in the shop are of the portable type.

Planning the Area

A thorough study was made of the printing industry in Iraq to (*a*) establish rapport, (*b*) determine the needs, (*c*) determine how the graphic-arts area in the new institute might meet those needs. A study was also made of the other schools to determine if there existed a need to offer the graphic arts on an industrial-arts level.

Results of the Studies. From the two studies, the number of students to be trained and the educational, age, and economic level of the students were determined. Moreover, the studies proved an invaluable aid when syllabi were developed.

The Shop. From a basic knowledge of the number of students to be expected, the levels of the students, courses to be taught, and the basic machines and equipment, the shop was planned:

Location: There was no floor preference to be considered since the shop was housed in a one-story separate building. (See layout on page 99.)

Shape of the Shop: Rectangular.

Size of the Shop: 4982 square feet.

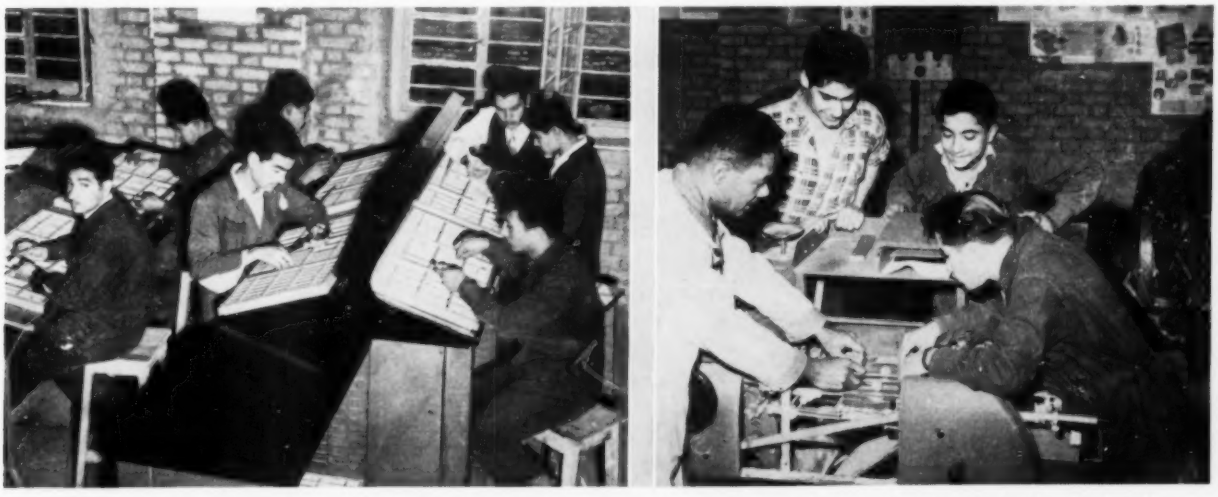
Floor Area per Student: 102 square feet.

Flooring: Nonskid concrete and inlaid tile.

Illumination: Natural light in Iraq is excellent; therefore, it was to be utilized extensively and supplemented with diffused artificial lighting in the shop and individual lights on the machines.

Heating and Ventilating: Heating was

*Bradley University Team/USOM (Iraq); leave of absence Florida A and M University, Tallahassee, Fla. Samuel E. Russell returned recently from a second assignment for the International Cooperation Administration, Department of State, in Baghdad, Iraq.



A group of students in hand composition with an Iraq instructor; at right, students study the Multilith with the American specialist at Baghdad Technical Institute, Baghdad, Iraq

accomplished with oil burning units. When the Institute is completed central heating should be installed. Adequate exhaust for the re-melt furnace and control of the casement windows aided ventilation immensely. If school ran into June, evaporative type air coolers had to be used because of the extremely low humidity and the high temperature which crept daily toward the 118 degrees mark.

Plumbing: Facilities were provided for washing and for darkroom work. In keeping with custom, the lavatory was in a different area, away from the shop.

Display Facilities: A four-by-eight ft. cork board with sliding glass front and well lighted was mounted just inside the main personnel entrance.

Special Features: An anteroom was provided to aid in keeping the shop relatively free from dust during the dust storm periods. The office area was glass enclosed for maximum teacher visibility.

The Curriculum

1st Year. Introduction to the graphic arts, hand composition, bindery operations, proofing, related studies.

2nd Year. Continuation of first year in addition to emphasis on layout and design, and on manually operated platen and cylinder presses; inks and papers.

3rd Year. Automatic platen and cylinder presses; making plates and operating small offset unit; Linotype operation and maintenance; estimating; related studies.

4th Year. Linotype operation and maintenance; shop practice in major areas; management; apprenticeship in industry. (NOTE: Typesetting students work in both English and Arabic languages.)

Because of the minute breakdown of jobs and operations in Iraq, a student successfully completing any course in the curriculum, except the course "Introduction to the Graphic Arts," is able to hold a payroll job. It was not expected that all students would complete the entire curriculum. However, a special attempt is being made to develop in those students who do complete the entire curriculum such assets as accuracy, rapid and positive motion, cleanliness, job pride, punctuality, initiative, and active imagination.

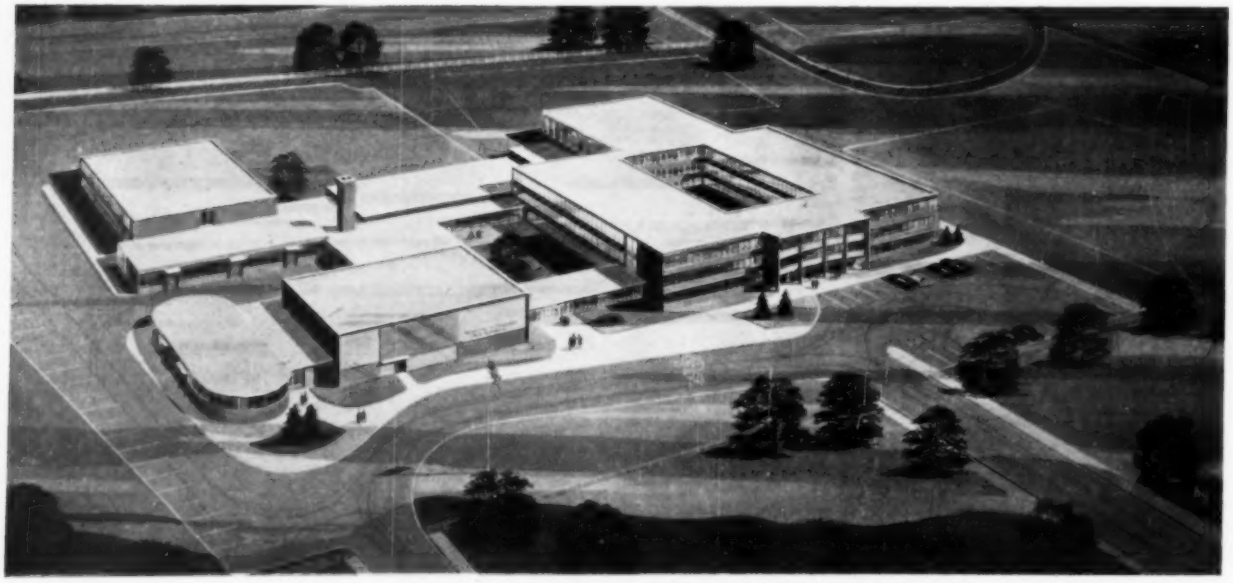
Sanford H. Calhoun High School

JULIUS C. BRAUN
Principal, Central High School
District No. 3
Merrick, N. Y.

The Sanford H. Calhoun High School, located in Central High School District No. 3 in the Bellmore-Merrick area on Long Island, N. Y., is a senior high school with a designed capacity of 1500 students.

This building, the second senior high school in the district, in addition to housing a broad program of industrial arts, also has a separate vocational education wing.

The industrial-arts area has three shops of 1800 square feet each with additional storage space. Added storage



Sanford H. Calhoun High School, Bellmore-Merrick, L. I., N. Y.
— Frederick P. Wiedersum Associates, architects

Sanford H. Calhoun High School Mechanical Drawing Rooms

1. Chalkboard; 2. tackboard; 3. table; 4. desk; 5. drafting tables; 6. blueprint machine; 7. washer; 8. sink; 9. dryer; 10. drawing file; 11. file; 12. closet; 13. general storage; 14. built-in storage; 15. storage.

for adult education projects is provided on the main floor adjacent to the shops as well as basement storage accessible directly from the woodshop floor. The three shops house woodworking and ceramics in one, metalworking and electricity in the second shop, with printing and textiles in a third shop. Each shop has two doors accessible to the corridor, an overhead door with ramp is provided for the electrical-metal shop. A delivery platform serves both the industrial arts and the vocational areas. Ample illuminated corridor display cases are provided throughout the shop areas.

The vocational wing is separate from but connected with the general instructional and related areas. It consists of a two-story structure with double loaded corridors which house facilities as follows on the first floor: automotive shop, carpentry shop, trade theory classroom, and director's office. On the second floor the following facilities are included: cosmetology, practical nursing, radio and television, trade electric shop, related science room, and two mechanical drawing rooms.

The vocational wing will serve the vocational needs of the entire high school district and will be one of the finest yet to be developed in New York State.

The automotive shop is 40 by 76 ft. with 3040 square feet. It has two doors leading to the corridor as well as two outside overhead doors with ramps. A hydraulic car lift is provided as well as a 2-ton hoist monorail system. The carpentry shop is 40 by 60 ft. with 2400 sq. ft. exclusive of storage and finishing room space. An office that is shared with the automotive shop is provided.

A well-equipped machine shop is 40 by 68 ft. exclusive of storage, tool crib, and instructor's office facilities. A trade theory classroom for related trade training covers 700 square feet. A suitable office for the Director of Vocational Education with conference room and storage is included.

The cosmetology classroom has 1200 square feet but also provides a dispensing room, storage and student locker room with 24 lockers. The practical nursing room with 1250 square feet includes a utility room, storage, a 15 locker dressing room and an office.

The Radio and T.V. trade electric shop has over 2000 square feet in addition to two separate storerooms. This well-equipped shop also has a 1-ton hoist with monorail. A 900 square foot related science room with storage is available.

The drawing and design facilities include two 900 square foot mechanical drawing rooms together with a sizeable print room and storage.

The architectural firm responsible for the unusual design of the Sanford H. Calhoun High School is Frederic P. Wiedersum Associates, Valley Stream, Long Island, N. Y.

Some 77 per cent of the country's freight is transported over the streets and roads of our nation by gasoline-powered motor vehicles. — *Petroleum Newsnotes.*

Paint that has come off during cleaning and left the bare plaster, may be retouched after removing the loose paint and then sealing with a thinned coat of fresh, white shellac. When dry the shellac will make for a good bond for the matching paint. — *Shellac Information Bureau.*

Drawing Center

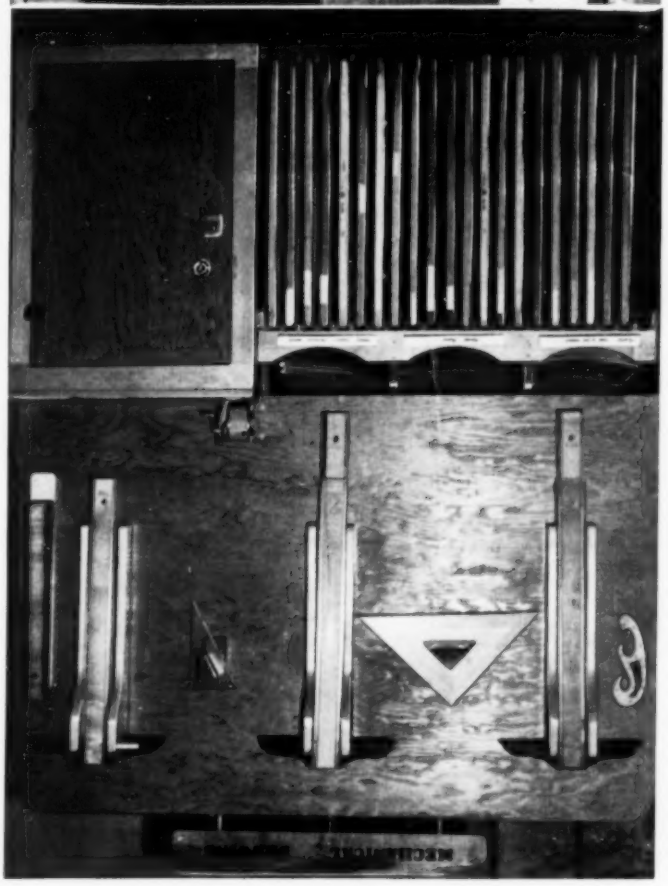
RICHARD J. PASCUZZO
Industrial Arts Department
Tioga Central School
Tioga Center, N. Y.

Here is a piece of equipment that is especially useful in a shop where mechanical drafting is taught. It serves as a storage unit for the mechanical drafting classes and also works very well as a planning center for the industrial-arts classes. The entire unit was planned and constructed by shop classes and cost approximately $45 to build.

Figure 1 shows that the drafting classes have a convenient place to store their equipment. The lower half of the unit holds the drawing boards and it has a compartment for storing supplies. The compartment can be locked, thus insuring a safe place to keep drawing sets and other expensive drawing materials. The upper section of this side has the racks and holders for T squares, triangles, straightedges and French curves. To make the unit more complete, the compartments, to the left, above the drawing boards provide the students with a place to turn in their plates. After the plates have been graded by the instructor, they are put in the center compartment where the student can review them. The last compartment, to the right, is for storing scales, rulers, and masking tape.

Figure 2 shows the other side of the unit which is a planning center for the industrial-arts classes. The bulletin board above each station provides a student with a place to tack up project ideas while he makes his drawing. To make this side of the unit more effective, a fluorescent light has been added.

We have found this unit to work very well for us. The racks keep wear and tear on the equipment down to a minimum. The unit has ample storage space which keeps the drawing tables free for all the classes to use. The instructor and students know where their plates are at all times. The center serves a dual purpose and is especially adaptable in shops where mechanical drafting is taught as another subject.



Figs. 1 and 2. Planning center for industrial arts students →

Television—A New Tool for Education

WILLIAM F. RASCHE
Director, Milwaukee Vocational and Adult Schools
Milwaukee, Wis.

Television Has a Permanent Place in Education

The Federal Communications Commission (FCC) allocated 242 television channels to education on April 14,1952. Since then, 28 operating educational television (ETV) stations have been established. Paul Walker, chairman of the FCC in 1952, promoted the use of educational channels vigorously and likened television to the invention of printing — a revolutionary force in the field of communications. He attributed great importance and significance to the development of this media by educators. Obviously, the potentialities of ETV are great.

The Educators Are Promoting ETV Actively

It is to the credit of the educators and their supporting community organizations that they are taking an active interest in ETV. They are claiming more of the remaining ETV channels and are continuing to establish additional educational stations. Also, it should be noted, the FCC has increased the number of ETV channels during the past five years from 242 to 256. Of these, 85 are on the VHF band and 171 on the UHF band.

Presently, of the 28 ETV stations which are in operation, 21 are on VHF channels. Five more ETV stations will be on the air by spring of 1958 and a total of 42 will be operating when the current school year, 1957–1958 closes. This progress is evidence of an active and accelerating interest in developing educational television facilities in our country.

ETV Has Both Friends and Foes

The educators have had both strong support and vigorous opposition. Among their friends are such national organizations as the Joint Council on Educational Television (JCET), the Fund for Adult Education, the Fund for the Advancement of Education, and the National Educational Television and Radio Center (ETRC). These organizations secure their financial support chiefly from the Ford Foundation.

The JCET Helped the Local Promoters of ETV

The JCET has worked closely with the FCC and the communities interested in establishing ETV stations. Ralph Steetle is the executive director of the JCET and is an effective leader. He has counseled with educational administrators in planning campaigns to establish ETV stations and has also responded to calls to participate in community meetings devoted to the ETV movement. The JCET has also distributed timely ETV information. In very large measure it has given needed direction to the movement in its most critical period, the initial five years.

The Fund for Adult Education Assisted Weak Stations Financially

The Fund for Adult Education was instrumental in furnishing money grants to establish ETV stations. The amounts granted were usually $100,000 and were used for the purchase of TV equipment. Each station which received such a grant agreed in turn to use the programming services of the ETRC and to install a kinescope for recording educational programs on film for exchange purposes.

The ETRC Organized a Network Service

The ETRC is a central agency located at Ann Arbor, Mich., which provides an exchange film service on a rental basis for ETV stations. The ETRC also enters into contracts with ETV stations for the production of film programs for its exchange service. It also secures suitable films from other sources for the use of ETV stations.

Experimental Research Is Undertaken in the Large Cities

The Fund for the Advancement of Education conducts experimental studies. It has made contracts with school systems of the major cities for studies of television instruction in elementary and secondary schools. Usually two elementary, two junior high, and two senior high schools, all of the same school system, are included in a study of this kind. Able and successful teachers are given preliminary workshop courses and then adequate time to prepare ETV courses in selected subjects. The experimental classes receive ETV instruction from these teachers in their own schools direct from specially mounted TV receiving sets. Their regular teachers usually give some preliminary instructions in anticipation of each TV lesson and, after its presentation, follow through to clarify points concerning which students raise questions. Progress of the experimental classes is checked and compared with the progress of control groups. The studies are made for several purposes — to improve instruction, reduce teacher shortages, and effect possible economies.

NBC and ETRC Are Providing Live Network Programs for ETV Stations

Other agencies also give assistance to the ETV stations. The National Broadcasting Company and the Educational Television and Radio Center are presently providing live programs over the NBC network from 5:00 to 5:30 p.m. (central standard time) on Mondays through Fridays. The current broadcasts began on November 28, 1957. The NBC series appearing on Monday evenings is entitled, "The International Geophysical Year." The Tuesday series is on Mathematics, the Wednesday series on Greek Mythology, and the Thursday series on Civilization and Its Resources. These four series originate in New York. The Friday series on Current Affairs is transmitted from Washington, D. C. All

five series are being transmitted as public service contributions to the ETV stations.

Private Corporations Have Contributed Facilities and Money to ETV Stations

Commercial television corporations have been helpful by contributing physical equipment. Facilities have been made available in other instances. In Milwaukee, station WMVS-TV has its studio in the central building of the Milwaukee Vocational and Adult Schools, located in the downtown area of the city. Its transmitter house is situated twelve miles away on the property of a commercial corporation known as Independent Television, Incorporated, which broadcasts from a tower that is 1040 feet high. The Milwaukee Board of Vocational and Adult Education accepted an offer from this corporation to permit the Board to sidemount the antenna of WMVS-TV on this tower with the electrical center of the antenna placed at the 750 foot level. Transmission from the studio to the transmitter is accomplished by microwave relay. The joint use of a tower by WITI-TV and WMVS-TV provides mutual advantages to the two stations as well as to those viewing their programs. Also, the Board of Vocational and Adult Education was spared the expense of building a tower. Some expense was added for the construction of the transmitter house. Even so, the total arrangement resulted in a substantial saving for the Board.

Commercial stations have made other contributions. In one city the governing board of an ETV station was given $30,000 by three commercial stations, each of which contributed $10,000 to the establishment of the educational station. Commercial stations also stand ready to lend personnel in emergency situations.

There Is Still Some Opposition to ETV

Notwithstanding all these evidences of fine co-operation, there have been opponents who in the beginning were hostile to the establishment of ETV stations. Some of these no longer oppose ETV. There are others that do. Some commercial interests argue that ETV channels allocated to the existing stations are used wastefully. The 28 ETV stations say, in return, that they have made a total capital investment in facilities valued at about $60,000,000 and that their broadcasts are available to more than 50,000,000 people. Furthermore, they are broadcasting programs suited to the needs of people living in an age of tension which is enlivened by the dramatic events our fast moving technology produces. Also, they are extending broadcasting schedules as greater resources become available to them.

Opposition Has Taken Several Forms

It is noteworthy that educators, in promoting ETV, have held their own against the opposition to which they have been exposed. Opposition has taken several forms. Some opposing groups have resorted to legal action to stop public boards from building stations. In a number of states attempts were made to secure restrictive legislation. Resort to the use of a referendum has been successful in one state. In that instance, the issue was the building of a state network with tax monies. The voters rejected the proposal.

In some cities there were many public debates. Among the arguments advanced against the establishment of ETV stations were the following:

1. The ETV stations will be operated by inexperienced teachers whose programs will be dry, musty, and amateurish.
2. The public will not view educational programs in sufficient numbers to warrant their operation.
3. The commercial stations will provide public service time to educators; therefore, tax money should not be provided for ETV.
4. The ETV channels will be used for dangerous propaganda.
5. The cost of establishing and operating ETV stations is prohibitive.

The ETV Stations Have Justified ETV

Five years of experimentation and operation have proved the foregoing statements to be wrong. The ETV stations, during their period of development, have shown that they are needed and are able to fill the need satisfactorily. The following facts should be considered:

1. The ETV stations already have developed instructors who have national reputations as superior TV teachers. These teachers offer instruction that is accurate, clear, interesting, and entertaining. The number of such teachers is increasing.

2. Commercial programs which are entertaining generally will attract a larger following than an educational program. Even so, the best commercial broadcast probably attracts only a little more than half of the potential audience. On the other hand, surveys of the response to educational programs show that specialized educational audiences, though smaller, are, nevertheless, substantial. The number sometimes attracted by a strong TV teacher in a single program will exceed the number of students the same teacher would meet in college classes in a lifetime of teaching.

3. Commercial stations can and do provide public service time to educators. Some educational stations require a full day of broadcasting time which commercial stations obviously cannot provide. In fact, station WQED has developed programming to such an extent that the station's governing board is seeking a second channel in Pittsburgh to broaden its offerings. Commercial stations at best can offer only part-time service and often at hours not too well suited to the purpose the educators have in mind for programs they may wish to broadcast.

4. America has depended on a school system manned by teachers it could trust to safeguard the American way of life. Day-school classes for all practical purposes are sheltered. Public observation of actual class operations, therefore, is very limited. On the other hand, all instruction sent out from an ETV station on an open circuit to students in the various schools of a school system or several systems can be followed on home sets by the parents. ETV instruction, therefore, is exposed to public scrutiny. Dangerous propaganda could not survive such a test.

5. The cost of establishing and operating ETV stations is not prohibitive even though the sums of money required are substantial. To evaluate costs it is necessary to relate capital and operating expenditures to the educational services rendered by ETV stations and elementary and secondary schools. An elementary school building of 24 rooms with a rated capacity of 30 each can accommodate 720 pupils. Such schools are in session about six hours per day and five days per week for a school year of 9 to 10 months. A building of this type would cost about $750,000 to build. Operating such a school might cost $150,000 to $175,000 per year.

An ETV station with two studios, a transmitter house, and tower with all necessary equipment can be constructed for $500,000 to $700,000. Most ETV stations are located in populous centers and operate on VHF channels which have coverage areas populated by a million or more people. In such metropolitan areas the people have many educational interests. An ETV station, therefore, will attract many special audiences.

Annual budgets of ETV stations vary. A new station usually begins operating on a limited schedule with a limited budget. Stations establish their full stride in three to five years. As they develop strength and secure additional financial resources, they increase their broadcast schedules. Annual budgets also increase accordingly. The budgets,

though sizable in themselves, are reasonable in terms of the great number of people each station serves and are but a small percentage of the total budget for all the public schools in the community where each station is located. Large city budgets range from $125,000 to $275,000. A $200,000 budget represents a charge of about 20 cents per resident in an area having at least one million people.

Several Types of Station Organization Exist

There are several plans for organizing educational stations. The governing bodies may be of the community or public type. Such bodies must be educational entities. Municipal and other political units of government not concerned with education directly do not qualify.

Local interest or certain limiting factors have determined the type of organization selected in each city which has an ETV station. In the large populous cities the tendency has been to form a corporation whose board is composed of representative members. Representation will embrace the cultural and educational groups of the coverage area of the station for which the corporation is the licensee. Such corporations raise funds in various ways. Industrial and business concerns and foundations contribute. Public schools usually contribute on the basis of a formula which is related to the school enrollment of the various systems participating. Public solicitations are also made. In some cities some corporations benefiting by special instruction give support on the basis of the number of employees they have in their service.

A public type of control exists in a number of places. Denver and Milwaukee are examples. The Board of Education of Denver is the licensee for station KRMA-TV. In Milwaukee the local Board of Vocational and Adult Education is the licensee for station WMVS-TV. Local taxation is one means of deriving support in such cities. However, contributions have been received from such funds as the Fund for Adult Education and the Fund for the Advancement of Education. These public boards also have advisory groups whose composition is representative of community, educational, and cultural interests. Financial assistance is also received from foundations, private donors, and business and industrial corporations.

A regional type of organization is also developing to establish networks. In Wisconsin, the state legislature has thrown a protective cloak over the channels allocated to the state and made the State Radio Council, a public body, the agency to protect the educational channels. Station WHA at Madison was first assigned to the Council. This station receives state funds for operation. The people in a referendum voted early against a tax-supported network. Thereupon WHA was later transferred to the state university and Channel 10 freed to allow the Board of Vocational Education to establish station WMVS-TV. It may be expected in time that in several states, in the East and South particularly, networks will develop. Alabama already has a three-station network.

Interest is also being shown in the development of regional networks which might embrace two or more states. In fact, in at least one instance, the FCC allocated one channel for joint use to two cities in different states which are located very close to each other. These are Duluth, Minn., and Superior, Wis. Were each state to develop a network of stations, these cities might become the connecting link between such networks.

Educational Service Is Both Formal and Informal

Educational television falls into two large classifications — the formal and the informal. Both types will appeal to children, young people and adults.

The formal type of educational television may be regular school instruction offered to children in elementary schools or young people in high schools. The studies currently being made by the Fund for the Advancement of Education in a dozen or more large cities are of this type. They include experimental audiences composed of students who are required to attend school. However, there are also large numbers of young people and adults who follow high school or college instruction on a voluntary basis who continue studying on marginal time and depend upon the local "High School of the Air" or "College of the Air" for such education. Such instruction is also formal.

The other type of educational tele-

At the left is Arthur Russell, winner of the $5000 national grand prize in the 1957 Fisher Body Craftsman's Guild contest. At the right is William Moore, national grand prize winner in the 1956 competition. Their scale model cars represent several hundred hours of work after the original designs were completed. Both boys are students at the Art Center School in Los Angeles, Calif., which supplies most of the designers to Detroit automobile companies and in the advertising and photographic professions

vision is informal. "The Friendly Giant" produced by Bob Homme is a children's program. It is educational, interesting, and entertaining. Professor Baxter's "The Written Word" is an adult series which viewers pursue not only because this series of programs is informative and interesting, but also because it is entertaining. There are many others of similar character.

ETV stations also broadcast programs that are formal for some viewers and informal for others. Thus a College of the Air may offer a course in psychology for credit. Those seeking college credit will register for the course, view the broadcasts, do the collateral reading, and write the examination. They study just as they would were they reporting to a class in residence instructed by a college professor. Several hundred students might enroll in such a TV course. They would be following the course formally.

Another group, perhaps two or more times as large, would follow the TV presentations and do the collateral reading but without an interest in earning credit. This would be a semiformal procedure. Experience has also shown that sometimes many thousands will follow the series as presented by TV without further study. They would be pursuing the instruction wholly on an informal basis.

ETV Has Come to Stay

As was said earlier, educational television has great possibilities. Now that it is gaining general acceptance, it is on the way to accomplishing great things. The use that is being made of it justifies the views held by its early promoters; namely, educational television is a necessity and not a luxury. The new problems, the shortage of school facilities, the shortage of funds, and the accelerating rise in the school population will compel boards of education, college trustees, and school administrators to employ this indispensable tool of education.

Education for Peace

T. A. HIPPAKA
Iowa State College
Ames, Iowa

"Where there is no vision, the people perish." These words have an ominous, familiar ring. But reverse them and they become bright with hope and challenge. For history has demonstrated again and again that "Where there is vision, the people triumph!"

Arthur C. Clarke
Former Chairman
British Interplanetary Society

Change is inevitable; it has always been the way of the world. Nations without vision have perished; they chose and clung to the old comfortable ways of doing things; they lacked courage, imagination, and the pioneering spirit. While the dire consequences of apathy and indifference to change have been slower in overtaking nations in the past, disaster has ultimately overtaken backward countries, nevertheless. Today, we do not have the time to choose between oblivion or greatness.

Is it any wonder that an unknown author was prompted to write:

On the plains of hesitation bleach the bones of countless millions who, at the dawn of victory, sat down to rest — and resting, died.

A World of Armaments

Today's world totters perilously on the verge of chaos that can hardly be imagined, held in place by a balance of terror between giant superpowers, Russia and the United States.

Editorial Quote
The Des Moines Register
December 25, 1957

Regrettably, we live in a world of terror, which may become even more terrible before it begins to get better. Two world powers, Russia and the United States, are investing most of their time, inventiveness, know-how, energy, research, and governmental budgets in even greater instruments of terror and potential destruction. The insane armaments race progresses at a hideous pace, and we hope against hope that a continuous stalemate, and better yet, even a slight lead in the race, will avert a world conflagration.

While World War III is not inevitable, there is always the possibility, remote as it may seem, that men in the Kremlin will stumble into such a war. The United States has never been an initial aggressor in a world war, and she does not intend to start World War III. However, there will be speedy and effective retaliation on her part should the Kremlin start an all-out conflagration. Defensivenesss can have its disadvantages.

The strangely corrupted mentalities of the despots in the Kremlin possess no moral principles. Should the Russian rulers really develop a superiority complex such as Hitler displayed when he decided that he could take the world through superior armed force, Russia's dictators might plunge the world into war. Added to such a complex, the Soviet rulers could refuse to believe that World War III would mean man's annihilation. They could disbelieve the idea that they, as well as we, would have no world at all.

On October 4, 1957, sounds emanating from the first man-made satellite struck new terror into the minds and hearts of men. No doubt, the Russians suffered failures before success crowned their efforts, but the failures were not publicized to the world, and not even to their own people. Failures are readily kept secret under the Soviet form of government. In America, we draw the line on publicity matters only when we believe the nation's security is jeopardized. To a very considerable extent, it is the responsibility of citizens in the United States to share their government's failures, as well as its successes.

It is obvious that the publicizing of a rocket-satellite failure such as occured in the United States on December 6, 1957, created controversial issues, such as are never allowed to develop among the peasants of Russia.

As early as June, 1945, Dr. Wernher von Braun, chief scientist on intermediate range ballistic missiles at the army's Redstone arsenal, Huntington, Ala., had recommended:

> Construction of multi-stage piloted rockets which would reach a maximum speed of over five miles a second outside the Earth's atmosphere.
>
> At such speeds the rocket would not return to Earth, as gravity and centrifugal forces would balance each other. In such a case the rocket would fly along a gravitational trajectory, without power, around the Earth in the same way as the moon.
>
> According to the distance of trajectory from the Earth, the rocket would complete one circuit around the Earth in any time between one and one-half hours and several days.
>
> The whole of the Earth's surface could be continuously observed from such a rocket.
>
> The crew could be equipped with telescopes and be able to observe even small objects, such as ships, icebergs, troop movements, construction work, etc.
>
> They could also carry out physical and astronomical research on problems which could only be tackled at that altitude, due to the absence of the atmosphere.

The year 1957 will long be remembered for Russia's success in launching Sputnik I and II; while the United States lost prestige in her failure to place a smaller satellite into outer space.

The fact that the December, 1957, issue of the *Atlantic Monthly* carried the following revelation made very little difference in the immediate attitude of people:

> One top Pentagon official has confessed privately that he was amazed at the world-wide reaction to Sputnik, and that at the time Vanguard had been up for Pentagon consideration he had deemed it a ridiculous waste of public funds. Other responsible officials say that in the spring of 1956, Dr. Wernher von Braun suggested using the Army's Jupiter C rocket on which he was working at the Redstone Arsenal to throw an American satellite into the heavens. Jupiter C's ability to do just that was demonstrated in September, 1956, when it was fired some 3300 miles at an altitude (600 miles) and speed comparable to that achieved by the Soviet rocket which launched the first Russian satellite.

The emotional disturbances created in the United States by the first Russian satellite, stimulated much concern regarding our safety as a nation. The alarmists visioned our quick annihilation if Russia decided to attack. Our supposedly helpless condition was choice political fodder for certain politicians. Europeans were gravely concerned but calm; they could not understand the emotionalism of the Americans. Much was said and written on this side of the Atlantic Ocean which smacked of great diversity of opinion and much confusion.

No less a person than Dr. Edward Teller, chief architect of the hydrogen bomb, had this to say:

> We have lost a major battle in science —a battle greater than Pearl Harbor.

An editorial in *The College Eye*, a student publication at Iowa State Teachers College, described the Soviet threat in these words:

> The Soviets have said they will bury us, and so they will, in a grave of lackadaisical immaturity, slovenly laziness, and dreamy idealism which we ourselves now are digging.
>
> In short, we must face it, the Soviets have thrown down the challenge. We may couch that challenge in even more drastic terms. "Learn or die."

The Russian successes and our failures in 1957 pitched our emotions to a new high at a time when we were not engaged in an all-out shooting war. One writer endeavored to convince Americans that the launching of Sputnik I brought us face to face with a problem worse than a depression. Still another author attempted to make us believe we were in worse trouble than that encountered in World War II. With such displays of emotionalism, it was evident that some Americans did not possess the necessary equilibrium to share our government's failures with reasonable stability.

Anyone who knows anything about research is fully aware that there are often innumerable failures before success crowns a scientist's efforts. No less a scientist than former Major General Leo Zansser, who helped administer the Nazi's V-2 rocket laboratory at Peenemunde, attempted to allay our fears with these assuring words:

> I do not believe the Russians are much ahead of the Americans, and all told are probably equal.

Gerhard Siegmund, one of the German scientists who was forced to go to Russia after World War II to serve under compulsion as a scientist, made some very interesting observations. He did not believe that the Russians had a super-fuel. He thought that they probably used a mixture of kerosene and oxygen. The Russian scientists lacked vital metals, even screws and nails, all of which made his research difficult. On the other hand, he noted a development in which necessity became the mother of invention:

> . . . Maybe this was to their advantage. It forced them to develop some of their own techniques and perhaps some of these turned out to be quite good.

What of Our Strength?

Regardless of the importance of the early Russian satellites as such, the events which occurred late in 1957 proved a rude awakening to the American public. As far as a first satellite in outer space was concerned, we had lost a race.

In spite of the alarmists in our country, America was still the greatest nation on the face of this earth, fully capable of protecting herself. We claimed broader goals than a mere satellite, as far as desired accomplishments were concerned, even in the important area of military defense; to say nothing of our scientific and technological endeavors as they pertained to the promotion of a way of life, which only America can offer. To a very large degree we will continue enjoying these accomplishments through periodic self-evaluation and by full use of the courage, initiative, inventiveness, intelligence, and the healthy, competitive spirit which our great country has displayed throughout her glorious history. Edward Crankshaw has given us these thoughts which every American might very well ponder.

> . . . The fact remains that the Soviet is still a moral and material desert dotted with gleaming cases of stupendous scientific achievement.
>
> The country which produced the first artificial planet to encircle the globe is still so short of trained manpower that in the whole of its capital city there is scarcely a man who can fit a bathroom tap correctly.
>
> The country which produced the first intercontinental missile is still unable to service and maintain efficiently the agricultural machinery which is still most desperately short in quantity. The country which produced the great jet airliner has virtually no motor cars outside the big cities and even in the cities they are few and inadequate indeed.
>
> In a word, we, and above all the Americans, still have an unchallengeable advantage over Russia, if only we can bring ourselves to analyze the true nature of that advantage and develop it consciously, steadfastly and in all humility.

There is proof beyond a doubt that the Russians do not enjoy the consumer goods made available to Americans in their country. The furtherance of the communistic state comes first in Russia. Standards of living are low. In America, the common man enjoys himself. He has more conveniences, food, clothing, housing, entertainment, automobiles, labor saving devices, tools, telephones, wonder drugs, and real freedom than any other people on the face of the earth.

Is it any wonder that Elizabeth Ellen Evans, an American high school girl, was stimulated to write these inspiring

lines entitled, "I Speak for Democracy:"

I am an American.
Listen to my words, Facist, Communist.
Listen well, for my country is a strong country, and my message is a strong message.
I am an American, and I speak for democracy.
My ancestors have left their blood on the green at Lexington and the snow at Valley Forge
. . . on the walls of Fort Sumter and the fields at Gettysburg
. . . on the waters of the River Marne and in the shadows of the Argonne Forest
. . . on the beachheads of Salerno and Normandy and the sands of Okinawa
. . . on the bare, bleak hills called Pork Chop and Old Baldy and Heartbreak Ridge.
A million and more of my countrymen have died for freedom.
My country is their eternal monument.
They live on in the laughter of a small boy as he watches a circus clown's antics
. . . and in the sweet, delicious coldness of the first bite of peppermint ice cream on the Fourth of July
. . . in the little tenseness of a baseball crowd as the umpire calls "Batter up!"
. . . and in the high school band's rendition of "Stars and Stripes Forever" in the Memorial Day parade
. . . in the clear, sharp ring of a school bell on a fall morning
. . . and in the triumph of a six-year-old as he reads aloud for the first time.
They live on in the eyes of an Ohio farmer surveying his acres of corn and potatoes and pasture
. . . and in the brilliant gold of hundreds of acres of wheat stretching across the flat miles of Kansas
. . . in the milling of cattle in the stockyards of Chicago
. . . the precision of an assembly line in an automobile factory in Detroit
. . . and the perpetual red glow of the nocturnal skylines of Pittsburgh and Birmingham and Gary.
They live on in the voice of a young Jewish boy saying the sacred words from the Torah: "Hear O Israel: the Lord our God, the Lord is One. Thou shalt love the Lord thy God with all thy heart and with all thy soul and with all thy might."
. . . and in the voice of a Catholic girl praying: "Hail, Mary, full of grace, the Lord is with thee. . . ."
. . . and in the voice of a Protestant boy singing: "A mighty Fortress is our God, A Bulwark never failing. . . ."
An American named Carl Sandburg wrote these words:
"I know a Jew fishcrier down on Maxwell Street with a voice like a north wind blowing over corn stubble in January.
He dangles herring before prospective customers evincing a joy identical with that of Pavlova dancing.
His face is that of a man terribly glad that God made fish, and customers to whom he may call his wares from a pushcart."
There is a voice in the soul of every human being that cries out to be free. America has answered that voice.
America has offered freedom and opportunity such as no land before her has ever known, to a Jew fishcrier down on Maxwell Street with the face of a man terribly glad to be selling fish. She has given him the right to own his pushcart, to sell his herring on Maxwell Street.
. . . She has given him an education for his children, and a tremendous faith in the nation that has made these things his.
Multiply that fishcrier by 160,000,000 — 160,000,000 mechanics and farmers and housewives and coal miners and truck drivers and chemists and lawyers and plumbers and priests — all glad, terribly glad to be what they are, terribly glad to be free to work and eat and sleep and speak and love and pray and live as they desire, as they believe!
And those 160,000,000 Americans — those 160,000,000 free Americans — have more roast beef and mashed potatoes, the yield of American labor and land;
. . . more automobiles and telephones,
. . . more safety razors and bathtubs,
. . . more Orlon sweaters and aureomycin, the fruits of American initiative and enterprise;
. . . more public schools and life insurance policies, the symbols of American security and faith in the future;
. . . more laughter and song — than any other people on earth!
This is my answer, Facist, Communist!
Show me a country greater than our country, show me a people more energetic, creative, progressive — bigger-hearted and happier than our people, not until then will I consider your way of life.
For I am an American, and I speak for democracy.

The armaments race with the United States is the Kremlin's most important activity. Nor do the Soviet rulers, backed to the hilt by armed might, neglect their propaganda programs and fear campaigns in other countries. As we continue to face the Russians in this mad race for armed supremacy, now extended into outer space, there will be no escaping a sense of values for America. A workable balance of expenditures between instruments of destruction and consumer goods will always be a problem. How much are we to spend on education and our propaganda programs? These and many other decisions are made by the people in America. In Russia, the Kremlin makes the decisions, and the common man has no other recourse but to accept them.

Gradually we began to see that the situation called for emotional stability, greater perspective and a realistic reexamination of our total defense effort. Adequate defense is more than a rocket-shooting contest between our country and a potential enemy. Adequate defense encompasses more than superiority in science, mathematics, and technology, important as they all are. Total defense is more than a modernized army, navy, and air force, working in complete accord, the importance of which nobody can deny. To scientific, technological, and military strength must be added the political, economic, moral, and spiritual assets of America. These we intend to preserve at all costs, as we cope with a government headed by unprincipled autocrats. In preserving the American way of life, we intend to prove to the world that we are a nation which covets no other country's resources; constantly exemplifying the highest ideals of morality in our dealings with the peoples of the world.

In reviewing our total strength in America, our sources of power are formidable, indeed. While we constantly strengthen our military means for preserving peace, we will continue to work for peace through the United Nations approach. The NATO organization permits us to have a respectable supply of deadly missiles within shooting distance of Moscow, as well as other centers of population. We have atomic submarines, well able to launch rockets with devistating results. Our Strategic Air Command constitutes the most powerful air force the world has ever known. Scientific and technical research will be continuously accelerated in the United States. America has never failed in a crisis, and she does not intend to fail in this contest. It will be a total effort, well articulated on various scientific and technical frontiers, involving not only the exploration of outer space, but the more effective management of the space in which we live, here on earth.

Russian Versus American Education

Let us make no mistake about it, the Kremlin has meticulously outlined long-run development programs, and every phase of education, including goals, teaching methods, curriculum, school administration, as well as school construction and equipment are an integral part of these programs. When school personnel or any phase of the educational system do not make their full contribution in furthering these programs, they are promptly eliminated. If we have no other reason for concern regarding our educational system, saving our own lives should constitute reason enough.

We need to recognize the marked differences in the educational systems of the United States and Russia. In America we hold that the individual is all-important, and that government is "of the people, by the people, and for the people." In Russia, the individual is a pawn of the State. In the Soviet

Union, youth is educated to serve the State. World domination by means of military, economic, propagandist, and scientific methods permeates Russia's educational system.

In her frantic effort to gain over-all supremacy in education, Russia is constantly emphasizing technical and scientific preparation, in order that her people can serve the communistic political, military, and economic machine to the greatest possible extent, while they remain moral and political morons. Soviet rulers do not believe in education for the sake of the human being; they do not even believe in education for education's sake. All education is absolutely functional, in order that the State will have at its command an army of trained specialists in science, engineering, and technology. Foreign languages, as well as science, are both considered imperative as instruments of state policy. Teachers, as well as students, are regimented to follow a strict party line. Failure to do so is fatal to both. Students never question their teachers, who must know party principles thoroughly. Regardless of reports from Russia, the American concepts of liberty and freedom must never be abandoned.

In their mad rush to produce narrow specialists in science, technology, and engineering, it is quite obvious that the Kremlin has a very real problem in keeping the people of Russia indoctrinated in Communism. To keep their people in ignorance of the comforts and privileges enjoyed by free people in other parts of the world is not a simple matter.

From the American viewpoint, we too have problems. We cherish our high standards of living, and rightfully so. We would be very loathe to part with them. Our country out produces the entire world in industrial goods. The very real question for Americans to answer is, "Can we preserve our free educational institutions and our way of life, as we match the Soviet military and propagandist effort?" Economic solvency, in itself, will continue to present a serious problem.

Dr. Harold Urey, the well-known physicist, thinks that Americans need to look to their sense of values. Using our great desire for motor cars as an example, he stated that "tail fins and big gaudy cars constitute signs of American decadence." Speaking about our automobile madness he went on to say:

> These over-powered gas-eaters are an idiotic waste. Some day we'll wake up in a serious conflict with our left-handed friend behind the Iron Curtain and we won't be able to get oil out of the Middle East. Maybe then we'll regret the waste of our resources on useless horsepower.

And just think of the money, materials and engineering talent that go into retooling for model changes to make last year's car obsolete and hasten it to the junk pile.

Dr. William L. Thomas, while speaking to the American Anthropological Association, warned the world, especially Russia and the United States, that the natural resources of this globe cannot hold out at the present rate of use. He further added that "in a few thousand years, our era will be referred to as the age of waste." We need to reflect on the idea that God left us a great world, if we could only develop the maturity to enjoy it sanely.

In view of the reported technical, scientific, and military developments in Russia, Americans must constantly reduce such advancement to their true proportions. In America we do not propose to convert our educational system into a means whereby we will dominate the world. However, we do intend to develop well-balanced people, superbly able to defend themselves, to preserve their country from internal, as well as external threats.

Total Building Construction

If there ever was a time when we should build and equip school plants as though our very lives depended upon such activities, the time is now. The Kremlin has constantly strengthened its diabolical threat to the free world, and to the United States in particular. Russia's first satellite signaled another milestone in her ever growing threat to the safety of free people, everywhere.

If we can preserve our way of life and still remain ahead of Russia technologically, scientifically, and militarily, and make her believe that we have such supremacy, we will avert an all out shooting war by continuing to fight a costly cold war. Regrettably, such is one of the primary objectives of our educational system in America. Whether we like it or not, this exigency has been forced upon us, and it will continue to haunt us for years to come.

Securing Adequate School Facilities Is Primarily a Public Relations Job

In America, the voters have the final word in the matter of plant construction, as well as general school policy. It was so decreed by our founding fathers. In other words, the level of our school activities cannot rise above the aspirations and support of our citizenry. What this amounts to is that the proposals of educators who have

Checkerboard bowl (the old glue-up procedure for lathe turning). The student is Angel Hernandez of Cottonwood High School. Picture submitted by photographer Stan Schirmacher, instructor at Papago School, Phoenix, Ariz.

earned the highest college degrees in the land, and who have piled up years of successful experience in their chosen fields can very well be at the mercy of taxpayers. While such processes tend to make democracy the most difficult form of government on the face of this earth, we nevertheless cherish such procedures. Because educational policies are established upon such a basis, educators are constantly challenged to exhibit the best of judgment, courage, salesmanship, and leadership in influencing a community in the right direction. Securing good school facilities is basically a public relations enterprise. Where taxpayers are intelligent and truly public spirited, we have good schools. If they are apathetic, selfish, and indifferent, we have poor schools. Good schools constitute proof that educators have performed a good public relations job.

Our most immediate as well as our most difficult task is to loosen the taxpayers purse strings. In order to do so, our public relations will have to be enhanced to the point where a change in the taxpayers sense of values will result in more money for our schools. Our tax programs will have to be overhauled. Our sales campaigns will have to be intensified and projected into the future, indefinitely. We will have to devise means that will prove to school patrons that school staffs are doing as good a job as can be expected of them considering the crowded, underequipped, under-manned, and underbuilt schools which their youngsters are compelled to attend. In the final analysis, there is very little wrong with our schools which money will not correct.

The key individual in any school building program is the superintendent of schools. High in the category of his professional functions is the management of people. He hopes to influence, not only his staff members, but local people from all walks of life, to take a genuine, personal interest in the schools. Where the entire staff works in total harmony, really meeting the needs of the community through purposeful activity, money for school purposes will be forthcoming.

Cultivating friendships constitutes an important activity for all staff members. They know that it is through friendships that much can be secured for the schools. Their personal friends can be counted upon to support school measures, and to promote any worthwhile educational projects. Here again, the superintendent spearheads friendship begetting activities.

The School Superintendent

Long before new school construction is contemplated, the superintendent has organized his entire school staff into a constructive, co-operative working unit. They have grown accustomed to working as a group on matters of general concern. They can work in smaller groups making constructive recommendations to the entire staff. Teachers and administrators realize that no individual or segment of the entire staff can have exactly what they want. Quite frequently the ultimate policy is one of compromise where people have "buried their hatchets" and submerged their personal desires for the common good of everyone concerned. Thus it is that the preliminary school plans are staff formulated, and reach the architect's office as such.

Never was it truer than it is today that the superintendent's primary function is to get people to work together. Where the entire staff functions as a highly co-operative unit, the superintendent is due much credit. Group activity, of which there should be much in a democracy is characterized by frank discussions resulting in sane overall policies, without any real impairment of friendships. Members of the staff not only accept group decisions, but they work wholeheartedly in the promotion of school policies resulting from group deliberations. Discussion, argument, and disagreement take place in the group, behind closed doors. "Dirty linens should never be washed in public." When disagreement among staff members becomes public property, public relations deteriorate. Taxpayers then lose confidence in their school staff, and the needed public support will not be forthcoming.

Continuous, concerted, staff effort, along realistic lines, constitutes the answer to a public relations program. Where public relations are adequate, students, as well as teachers, enjoy well-equipped classrooms, shops, and laboratories. Literally everything that educators do, in school or out of school, determines the staff's public relations.

Workable, staff-taxpayer relationships have their beginnings wherever young people are being taught. Satisfied students beget contented parents in the home. Admitting that we have a certain percentage of indolent youth in our schools, the fact remains that the larger percentage of them will attack difficult tasks with genuine zest if they have a tangible purpose. And they will still go home as the best salesmen of our educational system. As they grow to manhood and womanhood and really recognize the true worth of staff efforts, they can very well be more loyal to the schools than their parents were.

It goes without saying that the architect is an extremely important factor in the total planning ordeal. He is generally selected by the board of education, a duty which this body cannot escape. It is to be devoutly wished that such a group will listen attentively to the recommendations of the superintendent of schools. Quite frequently school board members are already acquainted with certain architects in and outside of the local community. In their wisdom, the school board will select an architect, who is not only legally qualified as such, but who will take suggestions from staff members. The architect welds these suggestions into a unified building plan, sections of which can be constructed at various times, if need be. Future additions will prove to be parts of the original plan, so that when the structure is eventually completed, the building will always remain a unified whole, of which the community can be proud.

Quite often, school board members are prone to visit newly constructed school buildings in other communities in order to gain workable ideas for their own local situation. This is as it should be. On the other hand, such visits can become a source of difficulty to staff members. Board members may return from a tour with the idea that what is good for a certain community is good enough for their locality. Such a decision may involve serious inadequacies, for the problems as well as the needs of the two communities involved may be entirely different. Decisions of this kind are readily avoided where school board members have been thoroughly briefed upon the problems and needs of their own community before they begin their visits. Here again, staff agreement has made the briefing process a meaningful one, and board members inspect other schools with definite goals in mind.

The board of education generally selects the building site. Community quarrels must be forgotten, and the school's location must be selected with vision, courage, and intelligence. The taxpayer, as well as the students who are to attend the school, must receive primary consideration. Time generally proves or disproves the wisdom of school boards in this all-important duty.

In the final analysis, the school board represents the people in the community. It is their duty to accept or reject the plans submitted to them. They initiate and promote bond issues. They accept or reject bids for building construction and equipment. In all of these activities they are responsible to the people in the community.

Some Direction Pointers in Shop Planning

As early as April, 1955, one of the leading Swedish newspapers, *Dagens*

Nyheter, made these prophetic observations:

The Soviet Union is about to become the technically best educated nation in the world, and there is every reason why the West should watch out. However, if America and Western Europe are to maintain their lead in the long run, it will be necessary to intensify technological and scientific research and education. We cannot, to be sure, shift the emphasis to these fields in the same way as the Soviet Union. The West has an equally great need of a powerful development of other sciences and other fields of research: the humanistic sciences, sociology, jurisprudence, medicine. But that does not mean that we cannot afford it. With the level that the national income has reached in Western Europe, and even more in the United States, total training and research costs per inhabitant undoubtedly could be considerably higher than what the Soviet Union can afford, without appreciably affecting the respective living standards.

Michael Paca emphasizes this observation:

The man of the year is the technician. He is the hope of industry; the worry and riddle of education; the link between science and technology; a mainstay of our strength and prosperity.

Accompanying the urgent need for engineers and scientists is a dire need for technicians. It has been well established in industry that we will always need more technicians than scientists and engineers, pressing as their availability may be.

Added to the constantly changing military urgency are at least three conditions in industry which increase the demand for technicians. Industries are expanding in size; automation is constantly increasing in scope and complexity; while new industries are continuously being created. There is no curtailment of acceleration and change in such industries as aeronautics, maritime construction, mining, air conditioning, machine tool manufacturing, food processing, building construction, electricity and electronics, petroleum, metallurgy, textiles, pulp and paper, wood products and ceramics. Research, sanitation, conservation, graphic arts, nuclear power, transportation, distribution of power, instrumentation, equipment maintenance and operation; all of these constitute areas of activity which not only need qualified scientists and engineers, but they will always afford excellent opportunities for adequately prepared technicians. It naturally follows that the technician must not be overlooked as we contemplate additional shop facilities.

John Chipman and Nicholas Grant, reporting to the Preparedness Investigating Subcommittee, had this to say regarding metallurgical education in Russia:

. . . Laboratory equipment for instruction in metallurgy in the Russian schools is superior to that in our own. This is true in respect to the quantity of good equipment available and the diversity and advanced nature of the laboratory experiments for which equipment is provided.

Although there are several levels of technicians, and while it is often dangerous to generalize, persons best suited to become such workers must possess definite qualifications. These qualifications could very well be classified under the category of personality traits. They are good citizens at all times. Their home life is pleasant. Job satisfaction remains at a high level. Technicians should be able to work and to get along with others. They should be able to communicate readily with others, verbally or in writing. Mathematics and science are essential in varying degrees, depending upon the situation in which the technicians find themselves. Not only must these workers possess the ability to dig out useful knowledge, but it is imperative that they be able to apply knowledge to the solution of problems. Mastery of fundamentals, coupled with an insatiable curiosity regarding new developments in their immediate work areas, as well as related fields, is extremely essential. Their health habits should be such that they come to work regularly in top mental and physical fitness. Enthusiasm for their work is imperative. Loyalty to their employers is essential. In the words of Paul Boynton:

There is no such thing as an uninteresting job. There are only uninteresting people. If you are going to work for a man, for heaven's sake work for him! The time to quit a job is when you cannot find any fun in it. And there is fun in working out the problems that confront you, in figuring out better ways of doing things. Work is regarding things in life. The busy person is rarely an unhappy person. He has no time to be.

The essential preparedness of a technician in any area of endeavor is never static. Change is continuous and inevitable. New fundamental principles, skills, techniques, and related information having to do with new materials of construction and processes peculiar to new developments, must be constantly mastered. Principles, skills, techniques, and knowledge mastered today may be so obsolete tomorrow that the industry or business will suffer serious financial losses where technicians lack adequate powers of adaptability.

Dr. Alvin Johnston has described well the technical world in which the worker finds himself today:

In a swiftly moving world, education simply cannot come to a stop — ever. Today's knowledge is tomorrow's ignorance. Monday's wisdom is Tuesday's folly. The only way to stay alive mentally is to keep on educating ourselves, just as we stay alive physically by continuing to eat and exercise.

Pupil needs constitute the chief guideposts in shop planning. Obviously, the world about us provides the direction pointers in this mattter. Educators need to step down from their ivory towers and continuously experience firsthand contacts with a fast-moving world. Equipment, materials of instruction, and school plants must permit the world and its realities to be brought as fully as possible into the school situation. If our planning ever provided flexibility and adaptability in school shops, we must have it now.

Theodore O. Yntema would leave us with this thought:

Unless a vocational course is intended to develop a skill that is either widely useful or of great importance per se, I do not believe it belongs in our universities or colleges or high schools.

Too often, other factors and not pupil needs determine what is to be taught. Inadequacies of equipment, school supplies, and school plants stifle essential activities. Quite frequently the instructor teaches that which he likes to teach or he presents subject matter which takes the least preparation on his part. Because he has been unsuccessful in securing equipment, supplies, and space, he may resort to makeshift activities which prepare the learner for nothing that is worthwhile. It takes courage to provide for real pupil needs.

There is no discounting the value of advisory councils made up of the community's leadership. Taxpayer participation always adds zeal to their interest in the schools. Interchange of ideas brings school and community problems to the fore where everyone can view them. Errors in judgment will be cut to a minimum.

In the words of Superintendent John M. Hickey of Erie, Pennsylvania:

We shall replace our poor equipment when we take our people of the community into partnership and determine that only good tools can be used to train skilled hands for good jobs.

The wise use of present equipment is imperative to the securing of additional equipment. Naturally, school board members are loathe to purchase additional tools and machines until the proper use of the already available equipment has been demonstrated to them. Where a new department is being contemplated, the board members right-

fully seek assurance that the equipment is necessary, as well as appropriate, and that it will be used in a workmanlike manner. Any errors in these matters bring disastrous effects for the future, making it most difficult to secure additional machinery and hand tools.

We need to believe that there are basic skills, as well as abilities, widely useful and transferable from one area of endeavor to another. Shops must therefore permit youth to acquire useful and transferable skills.

Let us remember that we should also provide for all learners who have the ability, and who aspire to become highly expert in areas of abstract endeavor. Occupations involving power, electronics, television, radio, and radar will always need expert workers.

In planning shops, we have to do more than merely meet community needs, although that phase of our responsibility will remain important. We need to remember that only fifty per cent of our young people remain in their home communities. The other half of our youth go elsewhere, and they too must be prepared to make a living and to live a life.

The workaday world places a high premium upon creativeness. It demands from the individual a mastery of the principles of design, initiative, imagination, and ingenuity. In order to exist, any commercial or industrial enterprise must have workers who possess creative ability; workers who bring about changes with salable values. Creativeness is the very lifeblood of free enterprise in a highly competitive world.

Industry is constantly searching for workers with proper attitudes toward work; people who are well grounded in fundamental skills and principles; workers who can discipline themselves to keep abreast of the times; and people who can apply basic skills and knowledge to the solution of problems. Employers place a high premium upon this kind of creativeness, and in their search for people who can think creatively, they are disposed to make very lucrative offers.

There will always be a demand for craftsmen, for the complex machinery employed in modern industry will have to be made by workmen with uncanny dexterity. We will always need draftsmen, patternmakers, foundry workers, machinists, tool and die makers, and plastic experts. Shop units should be planned accordingly, where the students are preparing to become experts in areas involving these crafts. Added to excellent craftsmanship, these workers must possess personal honesty.

Dr. Frank M. Surface, Consultant to Standard Oil Company (New Jersey), has placed a high premium on certain personality traits which should belong to every craftsman:

> . . . The first and most important characteristic for an employee is not only personal integrity but mental honesty. He ought to have, above all, an open mind — one which searches for facts and, once these facts are in hand, draws conclusions from them, irrespective of previously held opinions.
>
> Next, we want employees who can think for themselves, who are or can become self-starters, who are constantly offering new ideas and new suggestions. These, to me are the marks of a good employee and one who is likely to become a leader in his field.

We need to remember, too, that industry is not adverse to liberal education. As we provide the best of shops for young people, in order that they may receive realistic preparation in their chosen callings, we must remember that in America we desire well-balanced human beings. General education, of which industrial arts is an integral part, must never be neglected.

Theodore O. Yntema, vice-president, Finance, Ford Motor Company, places a premium upon general education in these words:

> One of the marks of an educated man — perhaps the most distinguished mark — is his ability to use what he knows in new situations. Once this is learned there is no limit to what he can do.

Pennsylvania's Bucks County Technical School

BENJAMIN J. NOVAK
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Vocational and technical schools in the United States are being organized in an interesting variety of patterns. Many are operated by local districts. Others are entirely state controlled. County schools are common. Newer arrangements feature several county regional schools, or area organizations combining the efforts of local districts in part of a county.

The new Bucks County Technical School, on the northeast boundary of Philadelphia, has been the object of careful planning since 1951. It is an area school, serving the lower part of the county, and comprising seven cooperating school districts. There are many features that promise to be advantageous over older organizational patterns. If these superiorities are realized, credit may be ascribed to a happy combination of many factors. Intelligent citizen, school, labor, and management groups all co-operated in working toward a large goal serving the common good. Enlightened federal and state legislation played an important role, and competent leadership joined all the components into a co-ordinated unit.

The postwar II industrial and population growth of the Delaware River Valley has been so spectacular as almost to defy up-to-date statistical reporting. To identify some industrial giants is certain to overlook others that are just as important. A leader in the parade was the mammoth United States Steel Company's Fairless plant. Built on square miles of farmland, it is the largest steel plant ever constructed at one time. Ore boats ply their way up the river from Venezuela. Almost overnight sizeable cities sprang from drawing board to full blown reality. Seemingly from nowhere appeared bustling wharves, refineries, chemical plants, and many other industrial and technical enterprises. Schools and recreational facilities were not forgotten, nor was the need for public technical and industrial education overlooked.

As early as 1951, representatives from labor, management, and six school districts of lower Bucks County formed a committee to develop local vocational and technical education. The Pennsylvania state co-ordinator for trade and industrial education, operating out of the University of Pennsylvania, offered key assistance in the planning.

Some Enlightened Legislation

Act No. 342 enacted by the Pennsylvania state legislature in 1953 has a number of important provisions pertinent to area technical schools.

The election of a county board of school directors is required in counties having a county superintendent of public schools. The board members serve for six-year terms. The board is authorized to establish and operate schools, departments, or classes in vocational industrial, agricultural, homemaking, and distributive occupational education. These are for youths and adults residing in school districts not already providing trade and industrial schools and departments.

They are to be known as "area technical schools," and as approved by the State Board for vocational education, may be organized as technical service centers where learners may attend full time, or may attend part time while enrolled in academic high schools.

One mandatory provision of the law was that the county board of school directors call a convention before April 1, 1954, of the school directors in a designated vocational attendance area, to vote on the establishment of area technical schools. Majority approval of the directors would be followed up by the organization and operation of an area technical school in the attendance area, on or after June 1, 1955. School districts voting against participation in the area technical school must vote again on the question at least once every two years thereafter.

The law provides that the county board of school directors operating an area technical school shall appoint an advisory board made up of members representing local trades, industries, occupations, and administrators of the participating school districts. Among the many duties and powers of the county boards providing area technical schools are: community surveys of need, employment of teachers, acquiring land and property for school purposes, and reporting and entering contracts.

The area technical school organization promises several advantages. The co-operation of relatively small units makes possible a larger practicable-sized working unit, while travel distance remains reasonable. Control is closer to home than it's likely to be in more remote state or county units, although some potential dangers still exist. For example, under the law there is the unlikely possibility that an area technical school could be under the control of a county board of directors, none of whom come from any of the districts supporting the school. With this possible eventuality in mind, the joint board of technical education for lower Bucks County secured the authority to be the operating board for technical education. Thus, the area technical school is in some respects like a department of comprehensive high schools. In other respects, it resembles a separate school district for which a joint committee of the board meets at monthly intervals.

Financial subsidy is obtained from federal and state funds in the usual manner provided for the support of vocational education.

A Dream Approaches Reality

Early organizational plans for the technical school called for a jointure of the board members of the seven co-operating districts. This was shortly modified to the area pattern just described. The participating districts are: Bensalem Township, Bristol Township, Falls Township, Lower Makefield Township, Morrisville Borough, Tullytown Borough, and Yardley Borough. These districts are served by four high schools, namely: Bensalem, Delhaas, Morrisville, and Pennsbury.

A general advisory committee was established of persons from business, labor, and industry. Three surveys were made at different times of student occupational interests in grades nine, ten, and eleven. One in 1952 covered the entire county, another in 1953 included the lower county, and the third in 1956 was limited to the Bensalem, Delhaas, Morrisville, and Pennsbury High Schools. Other surveys and studies included the population growth of the area, number of industrial and business establishments, occupations in these businesses and industries, employment possibilities, and occupations of parents of students.

Careful review of these population, industrial, and employment data led to the selection of occupations in 18 trade areas. These were: Auto Body Repair, Auto Mechanics, Building Trades, Commercial Art, Cosmetology, Drafting, Electrical Construction, Electronics, Foods Preparation, Industrial Chemistry, Instrumentation, Machine Shop, Medical and Dental Secretary, Practical Nursing, Printing, Retail Sales, Sheet Metal, and Welding. Advisory Committees for each area were organized, to aid in the detailed planning. No less than forty-six companies are participating on advisory committees. (See list.)

George M. Schaffer was engaged as principal of the school in March 1, 1956, in so doing relinquishing his post as Pennsylvania's Chief of Trade and Industrial Education. He has since been working on a full-time basis in directing and co-ordinating the project. The community is to be congratulated on its foresight in employing a director early enough to play a real and vital part in the work. It is a good example that might well be followed more often.

The building is under construction on a 47 acre plot of land on Newportville Road, near the well-known Pennsylvania Turnpike. The location is central in relation to the participating high schools, and to the major industries. The million-and-a-half dollar structure has a "T" shaped floor plan, and the building has an attractive, yet practical factory type construction. Because of the curriculum contemplated, there will be no classrooms. All instructional areas will consist of shops and laboratories. It is interesting to note that the shop area is entirely without corridors. This was prompted by the following considerations:

1. Corridors are not needed because convenient exterior entrances can be used.
2. Absence of corridors permits greater utilization of space for instruction.
3. Less maintenance is required.
4. The arrangement more nearly simulates industrial facilities.

The construction permits additions to be made easily as population increases, and the resale value should be high if a shift of location should ever become necessary.

Students will attend the technical school fifty per cent of their school time. Instruction will be provided in occupational skills and related subjects like mathematics, science, blueprint reading, and trade theory. The related instruction will be taught in the shop or laboratory by the trade teacher. These instructors will be well qualified, being required to present the minimum of six years of trade experience and 30 semester hours of professional preparation prescribed by the state.

The students will spend the other half of their school time at their home high school. Here will be provided academic subjects, athletics, art, music, and other activities. Opportunity will be available for the election of subjects meeting college entrance requirements.

Pupils thus will not lose their identity with their home high school, which will also issue the diploma of graduation.

The Bucks County Technical School will serve day school students whose needs fall in one of the following main categories:

1. Those whose primary purpose is entry upon gainful employment after high school graduation.
2. Those planning to continue their formal education after graduation, and seek to become technicians at an employment level between that of the skilled worker and the professional engineer.
3. Those having to leave school before graduating may acquire skill in operating one or more machines, thus acquiring a marketable skill, and becoming a useful and productive citizen.
4. Those with physical handicaps may acquire skills enabling self-sufficiency in society.

Adult education is projected, with extension instruction for the employed, and pre-employment training for the unemployed. Related instruction will be available for apprentices, and rehabilitation training for the physically handicapped.

Present headquarters for the Principal, George Schaffer, are at the historic Summerseat Building, in Morrisville. Erected in 1773, Summerseat was the headquarters for George Washington between December 8 and 14, 1776, shortly before the decisive battle of Trenton, on Christmas night. The building was also at different times, the home of Robert Morris and George Clymer, signers of the Declaration of Independence and of the Constitution. One finds an interesting blend of history and modernity in Mr. Schaffer's bustling office. One feels like a witness to a newer, but none the less real, form of pioneering in which citizens from all fields of endeavor are lending firm, sustained, and unified support.

The Bristol Courier of April 25, 1956, carries an article by George G. Gray, from which an especially significant excerpt may be drawn:

Achievement of this vocational school has taken a bit of doing by educators and sensitive school board people alike. It represents a jointure, in a way of speaking, of a generous quantity of vision and some infinitely practical thinking about present-day educational requirements.

In the report of the joint meeting of industry, business and technical education dated June 5, 1956, one finds the unequivocating comment: "We will support this project with all our means and effort."

Here is a forward-looking development in vocational education that promises success. Perhaps in many ways, it will be a model for many others.

BUCKS COUNTY TECHNICAL SCHOOL

Companies Participating on Advisory Committees

Badenhausen Corporation
Penn Salt Chemical Company
Eddington Metal Specialty Company
Kaiser Metal Corporation
Rohm & Haas Company
Kemline Metal Company
McCrory's Stores, Inc.
Pomeroy's Department Store
Minnesota Mining & Mfg. Company
Lower Bucks County Hospital
Hunter-Bristol Corporation
Victor Chemical Corporation
Schutte & Koerting
Simpson Chevrolet
Bristol Courier
Delaware Valley Chamber of Commerce
Carlos Beauticians
Paterson Parchment Paper Company
Manhattan Soap Company
Cornwells Industries
U. S. Steel Corporation, Fairless Works
American Federation of Labor
C. I. O.
International Business Machines Corp.
International Restaurant Association
U. S. Steel Corporation, National Tube
Lower Bucks County Chamber of Commerce
Morrisville Motors
Bristol Ford
DeSoto-Plymouth
Bristol Nash
Harbison Oldsmobile, Inc.
Tri-County Construction Company
Frankford Supply
Tony Lee Associates
Kohli Electric Company
Underwriters Laboratories
Pennsylvania Railroad
Philco Corporation
Victor Chemical Works
Minneapolis-Honeywell
Medical Association
Dental Association
The Hermitage Press
Bucks County Printing House
Union Supply Company

An Outline for a Course in School Shop Planning

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Major Parts of the Course of Study

Course objectives: Such objectives have a direct relationship to the course. They may be stated in terms of understandings, appreciation, application, the development of certain physical skills, etc.

General organization: This item includes: (1) general statements of methods of instruction; (2) time limit for the course; (3) safety precautions, if any; (4) expenditures by students for materials and supplies; (5) teacher classroom controls; (6) student classroom controls; (7) instructional aids; (8) types of tests; and (9) course references.

Outline of instructional units: Such an outline may include specific statements concerning the kinds and format

of instruction sheets to be used and an outline of each instructional unit.

Sample Course Objectives

The objectives of the course, SHOP PLANNING, are to develop: (1) an appreciation and understanding of the principles of school-shop planning; (2) the ability to apply these principles; and (3) the ability on the part of supervisors and administrators to analyze and organize shop-planning problems for specific situations.

Sample — General Organization

General statement of methods of instruction: This course will be presented by means of (1) lectures; (2) discussions; (3) demonstrations; (4) conferences; and (5) group activities. For group activity, the class may be divided into common interest groups for purposes of studying and reporting problems.

Time available: This course will consist of .... periods of .... minutes per period each week for a total of .... weeks or semester(s). (Give the number of period hours per week, the number of minutes in a period hour, and the number of weeks or semesters that the course is to last.) The approximate time allotment for each instructional unit varies.

Safety precautions: (1) When hand tools or power driven machinery are used to make models, the safety precautions apply that normally obtain when handling such tools and machinery. (2) When drawing plans or making sketches observe all commensurate health and safety rules; (3) when inspecting existing shops, make sure that no hazardous conditions exist. An information sheet on safety precautions may be included among the instruction sheets.

Expenditures by students: This course necessitates (1) the taking of a few local trips for gathering information; (2) the use of suitable materials for making models; (3) the use of drawing materials, equipment, and tools; and (4) the use of small amounts of finishing materials such as sandpaper, lacquer, and paint. Although an amount of money is involved, the amount will be reduced in proportion to existing circumstances. It is estimated that the expenditures per student will amount to a minimum of .... (List the estimated minimum amount.)

Teacher classroom controls: Control (1) opening and closing of classroom activities; (2) teaching techniques such as lectures, demonstrations, discussions; and (3) student evaluation.

Student classroom controls: (1) attendance records; (2) interest-group organization and internal function; (3) evaluation; and (4) others. (Others may be added.)

Instructional aids: (1) Instructional aids are of great value in supplementing instructional methods; (2) they will be used where necessary; (3) the general types to be used are display boards, mock-ups, opaque projector and materials to be projected, filmstrips, books, and various printed materials; and (4) many of these aids such as mock-ups and models may be teacher-made while free literature having specific application to the course may be obtained and provisions may be made for obtaining pertinent filmstrips.

Types of tests: As a partial means of evaluating progress, thought provoking questions are included at the end of each lesson within an instructional unit. Such problems appear on *assignment sheets* and are presented in the form of informal objective and controlled essay test types. For maximum learning, the instructional units are progressive in nature and the problems involved are progressive — i.e., the problems on a preceding assignment sheet have a bearing on the problems of its succeeding assignment sheet.

Course references: List, in an acceptable form, all references to be used in the course. They include books, magazine articles, catalogues, etc.

Sample: Outline of Instructional Units

General statement: There are .... instructional units in this course (indicate the number of instructional units). Each unit has several lessons. Instruction sheets are to be prepared for each lesson. They will be *information sheets and assignment sheets.* Information sheets may contain topics which are taken from "Topics to be presented" or "Topics to be reviewed" in the "Outline of Instructional Units." Assignment sheets may contain problems which have a direct bearing on the lesson in question.

Unit I: Introduction to Planning

Approximate time.....

Objectives: To develop an appreciation and understanding of the following:

1. The concept of planning
2. The concept of school shop planning
3. Initial steps to be taken in school shop planning—community relations

Lesson 1: The concept of planning

Topics to be presented:

1. Planning in everyday life — its importance
2. School shop planning — its importance in modern industrial education

Lesson 2: Initial planning steps to be taken for a new shop or for renovating a shop

Topics to be presented:

1. Determining the school objectives
2. Determining the departmental objectives
3. Determining the shop objectives
4. Surveying existing facilities

Lesson 3: Other planning steps to be taken for a new shop or for renovating a shop

Topics to be presented:

Conferences with concerned and interested persons

- *a*) The principal
- *b*) The supervisor
- *c*) Teachers of other industrial subjects
- *d*) Advisory committee
- *e*) School architect
- *f*) Other concerned persons (reconcile the endeavor with other concerned persons)
- *g*) Parent-Teacher Association

Unit II: Controlling Elements in Planning the Shop Building

Approximate time.....

Objectives: To develop an appreciation and understanding of:

1. Controlling elements in planning the interior and exterior of a school shop building or a school shop room
2. The application of such controlling elements

Lesson 1: Factors governing the location of the shop building

Topics to be presented:

1. Location of the building site
2. The separate shop building and the shop that is a part of a larger building
   - *a*) Some advantages of a separate shop building
     1) Isolation or elimination of noises and odors
     2) Orientation of building for light and servicings
     3) Adaptability to future expansion
   - *b*) Some disadvantages of a separate shop building
     1) Construction cost
     2) Exposure of personnel to inclement weather if no provisions are made for covered walks
     3) Time consumed by trainees in going to and from the main building and shop
     4) Possible stigma effects

Lesson 2: Factors governing the exterior size and shape of the shop building

Topics to be presented:

1. Location of shop in relationship to other buildings
2. Size and shape of shop building in regard to:

a) Providing natural light
b) Allowing for internal control and visibility
c) Providing adequate service entrances and exits
d) Providing the desired auxiliary rooms

3. Availability of ground space
4. Type of program offerings
   a) Exploratory program (general shop size requirements)
   b) Trade preparatory (unit shop and general unit shop size requirements)
5. Floor space requirements for open shop area and auxiliary rooms
   a) Kinds, quantity, and size of auxiliary rooms
   b) Work stations
   c) Area occupied by other fixed equipment
6. Roof and ceiling heights
   a) Their relationship to the size and shape of the building
   b) Controlling elements in ceiling heights
      1) Relationship of shop ceiling height to ceiling heights of other rooms
      2) Internal auxiliary rooms, mezzanine floors, and other floors
      3) Providing proper internal temperature, light, and ventilation
      4) Construction costs
7. Floor levels
8. Auxiliary arrangements
   a) Exterior stairs
   b) Exterior ramps and loading docks

Lesson 3: Factors governing the interior arrangement of the shop room or shop building

Topics to be presented:

1. Type of shop building desired
2. Type of shop desired (unit general unit, general)
3. Space allowances and maximum utilization of space
   a) Work stations
   b) Isles of travel and safety lanes
   c) Assembly areas
   d) Kinds and amount of floors in a given shop room or shop building
   e) Size, amount, and location of auxiliary rooms
4. Providing for health and safety
   a) Arrangement of fire fighting equipment
   b) Arranging the interior of the shop to allow for proper visibility and control
   c) Lighting (natural and artificial)
   d) Arrangement of first aid kits
   e) Ventilation and waste disposal
   f) Color dynamics

Lesson 4: General architectural considerations in planning the interior and exterior of the school shop

Topics to be presented:

1. Walls, inside finish, and noise abatement
2. Doors (purpose and kind)
3. Windows (sizes, types of frames, where used)
4. Inside partitions (permanent and flexible or movable types)
5. Floors
6. Heat, ventilation, and waste disposal
7. Utilities
8. Special foundations

Unit III: Controlling Elements of Equipment and Hand Tool Lists

Approximate time.....

Objectives: To develop an appreciation of:

1. Factors which determine the kind and size of equipment and tools for the school shop
2. Factors which govern the location of equipment and tools in the school shop

Lesson 1: Controlling elements of shop power equipment

Topics to be presented:

1. The size of machinery needed
   a) Use to which the machinery is to be put
      1) Sizes of machinery
      2) Construction of machinery
   b) Type of program offered or to be offered
   c) Budgetary considerations
2. Safety provisions and the installation of power tools, fixed machines, and other electrically operated equipment
   a) Position of a machine in relationship to another
   b) Position of fixed machines in relationship to isles of travel and sequence of operations
   c) Nonskid floor areas at critical machines
   d) Proper lighting at critical machines
   e) Proper installation and identification of electric switches
   f) Proper installation of electric power
   g) Special foundations
3. Quality of machinery
4. Kinds and quantities of power equipment based upon (1) operations to be performed, (2) number of trainees to be served, and (3) frequency of use

Lesson 2: Controlling elements of hand tool lists

Topics to be presented:

1. Size of tools
   a) Age of students to be served
   b) Type of work to be performed
2. Quality of tools
3. Kinds and quantity (as to use)
   a) Kinds (based upon the design of the tool)
      1) General purpose tools
      2) Special purpose tools
   b) Quantity (based upon an analysis of frequency of use)
      1) Tools that are used frequently
      2) Tools that are used occasionally
4. Tool storage
   a) Toolrooms and tool cribs
   b) Wall tool cabinets
   c) Tool panels
   d) Combination arrangements

Lesson 3: Controlling elements of other fixed or semiportable equipment

Topics to be presented:

1. Type of equipment desired
   a) General purpose
   b) Special purpose
2. Special features of such equipment
3. Special installation of such equipment
4. Cost vs. utility of such equipment

Unit IV: Methods of Making a Shop Plan (Layout)

Approximate time.....

Objectives: To develop:

1. An understanding of the methods which are used to make a school shop plan
2. An understanding of the application of these methods

Lesson 1: A method of making a shop plan — the "template method"

Lesson 2: A method of making a shop plan — the "scale model method" or the "3-dimensional scale block method"

Unit V: Planning a Shop

Approximate time.....

Objectives: To develop:

1. An appreciation of the methods which are used for planning a school shop (a new shop or renovating an existing shop)
2. The ability to make an analysis of a shop planning problem
3. The ability to do the basic manipulative skills in making a shop layout

Lesson 1: Make an analysis of a shop planning problem (Areas of influence affecting the total planning problem). The students will analyze chosen shop situations.

Topics to be reviewed:

1. Areas of influence
   a) Need (existing or future)
   b) Philosophy and organization
      1) Philosophy of industrial education and of the particular phase of industrial education
      2) Organization of the school environment
      3) Aims and objectives of:
         (*a*) The school in question
         (*b*) The department (if applicable to the situation chosen for study)
         (*c*) Shop in question
      4) Shop organization and offerings (present and future)
         (*a*) Nature of instruction (Students who are en-

rolled in this course should have as a guide a course of study for all shop courses to be taught in the shop(s) in question

(*b*) Types of classes to be served

(*c*) Number and length of class periods

c) Shop physical arrangements

1) Space requirements

(*a*) Open shop area

(*b*) Auxiliary rooms (kinds, sizes, and total floor area needed)

(*c*) Expected maximum size of class to be accommodated

2) Permanency of shop arrangement

3) Utilities, light (natural and artificial), and waste disposal

4) Storage for instructional equipment, materials, and supplies

5) Shop safety

Lesson 2: Make an analysis of a shop planning problem (a study of check points for various shops). The students will study check points in planning various types of shops. These check points may be found among literature on school shop planning.

1. Automotive shop
2. Electric shop
3. General shop (industrial arts)
4. Graphic arts shop
5. Machine shop
6. Woodworking shop
7. Other

Lesson 3: Writing specifications

Topics to be presented:

1. The importance of written specifications
2. Writing specifications concerning special structural arrangements
3. Writing specifications concerning special equipment, etc.
4. Write a set of specifications for any special equipment or arrangements to be incorporated into the shop which is chosen for study

Lesson 4: Plan a school shop — make a layout

The students will apply the principles which they have learned to the planning of a school shop by using the "Template Method" or the "Scale Model Method" or a combination of both. The specifications from lesson 3 will be used.

Sample: Instruction Sheets

Shop Planning, Unit II — Lesson 3
Information Sheet No.....
Factors Governing the Interior Arrangement of the Shop Room or the Shop Building

Objectives: To develop:

1. An appreciation and understanding of the factors governing the interior arrangement of the shop
2. The ability to analyze existing facilities in terms of these factors

Information:

In Lesson 2 of Unit II, some of the factors governing the exterior size and shape of the school shop building were considered. In this lesson, some of the factors governing the interior arrangement are considered. The interior arrangement has a bearing on the exterior size and shape of the building as has been pointed out in Lesson 2 of this unit. There are, however, factors which are peculiar to the interior of the shop and are emphasized in this lesson. The following have a bearing on the interior arrangement:

1. *Type of shop desired:* Refer to "Shapes of Shop Buildings," *Supplement Number 2 of Lesson 2* for a discussion of the types of shops which are in general use.
2. *Enrollment and work stations:* The amount of floor space to be provided depends, among other things, upon the kind of shop and the maximum enrollment to be accommodated. In planning, the present and future requirements of instruction and enrollment should be considered and provisions made for same. Generally, if a machine, workbench, toolroom, or assembly area occupies space and is used for work, it may be referred to as a *work station*. Work stations in the open shop area and auxiliary rooms should be provided in sufficient amounts.
3. *Minimum requirements of space for certain types of shops:* Space requirements should be considered. Among other things, the arrangement of work stations and other equipment or fixtures should be done in order to allow not less than the minimum amount of floor space necessary for effective work. Adequate floor space allowances should be made for auxiliary rooms as well as for the open shop area. Refer to "Space Allotments Recommended for Open Shop Areas," *Information Sheet, Unit II, Lesson 2*. To get an idea of the arrangement of workbenches and machines, refer to "Supplement Number 1" to this unit. If additional storage space is needed and the ground floor area is insufficient to accommodate such space, a mezzanine floor may be considered.
4. *Floors:* Wherein it becomes necessary to have more than one type of floor in a single shop, the arrangement or location of these floors in relationship to the interior of the shop, utility, and health and safety, is important.
5. *Size, amount, and location of auxiliary rooms:* The size of auxiliary rooms has a bearing on the interior arrangement. Likewise, the kind and amount of auxiliary rooms has a bearing on the arrangement. The location of such rooms is generally governed by (1) visibility, (2) the type of activities to be performed therein, and (3) allowances for the greatest amount of open shop floor area.
6. *Health and safety:* Internal arrangements should reflect a consideration of:
   a) Proper arrangement of fire fighting equipment
   b) Allowances for visibility and control
   c) Allowances for isles of travel and sequence of operations
   d) Proper arrangement of first aid kit(s)
   e) Proper allowances and arrangements for heating, ventilation, and waste disposal
   f) Natural and artificial light
   g) The application of color dynamics

Assignment:

See "Assignment Sheet" for this lesson

Shop Planning, Unit II — Lesson 3
Assignment Sheet No.....
Factors Governing the Interior Arrangement of the Shop Room or the Shop Building

1. List at least four (4) factors which govern the interior arrangement of the school shop.
   a) .....
   b) .....
   c) .....
   d) .....
2. Identify the shop situation which you have chosen for study
   a) The shop is one that exists..... The shop is to be a new one and various floor plans are to be studied.....
   b) The shop is (is to be) a general shop...., unit shop...., general unit shop...., other.....
   c) What trade or trades will be represented? .....
3. Observe the location of machinery, auxiliary rooms, tool cabinets (if used), and other work stations in the shop which you have chosen for study, then, answer the following questions:
   a) Is the location of machinery satisfactory? Yes.... No....
   b) Why is the location satisfactory or unsatisfactory?.....

.....
.....
.....
.....

c) Is the location of auxiliary rooms satisfactory? Yes.... No....

d) Why is the location satisfactory or unsatisfactory?.....
.....
.....
.....
.....

e) If there are tool cabinets occupying floor space, are they located satisfactorily? Yes.... No....

f) Why are they satisfactorily or unsatisfactorily located? .....
.....
.....
.....
.....

g) Are arrangements for health and safety adequate? Yes... No...

h) Why are these arrangements adequate or inadequate?.....
.....
.....
.....
.....

References:

Unit II, Lessons 2 and 3
Supplements to Unit II, Lessons 2 and 3
The situation chosen for study
Shop Planning, Unit IV — Lesson 1
Assignment Sheet No.....
A Method of Making a Shop Plan — the "Template Method"

Tools and equipment needed:

T square
Tape (to be used if an actual shop is to be measured)
Drawing board
Drawing instruments (optional)
Triangles

Supplies needed:

Paper (for making sketches)
Heavy paper or cardboard (for templates)
Pencils
Eraser
Thumbtacks or masking tape

So far, you have studied the factors which are involved in shop planning and have made certain tentative decisions in light of these factors. Machinery and hand tools that are necessary for effective teaching have been listed and recommendations for additional machinery and hand tools have been made. This lesson is concerned with the preliminary phases of making a plan (layout) by means of templates. Most of the work of this unit is preliminary to Lesson 4, Unit V.

Relative to the situation which you have chosen for study, solve the following problems:

1. Obtain from catalogues, other reference materials, or by measuring actual objects the dimensions and shape of machinery and fixed equipment to be incorporated in the layout. Consider the equipment for auxiliary rooms also.
2. By using a scale of ¼ inch equals 1 foot make templates of machinery and fixed equipment to be incorporated. On machinery templates, indicate the direction of feed. This may be done by placing arrows on the template.
3. Make a preliminary sketch of the way you wish the floor plan to be. Do not include machinery and fixed equipment on the sketch as they appear in the form of templates. The preliminary sketch should include the following:
   a) Dimensions and shape of shop room or shop building
   b) Tentative location and dimensions of auxiliary rooms
   c) Thickness of walls
   d) Tentative location and dimensions of entrances, exits, and windows

References:

1. The shop situation which you have chosen for study
2. Catalogues and other literature containing specifications of machinery, equipment, and fixtures
3. Information sheets for Units II and III
4. Information sheets for Unit IV, Lesson 1
5. Supplement No. 1, Unit IV, Lesson 1
6. Other references may be listed

Shop Planning, Unit IV — Lesson 2
Information Sheet No.....
A Method of Making a Shop Plan — the "3-Dimensional Scale Block Method"

Objective: To develop an appreciation and understanding of the 3-dimensional block layout — its implications for aiding in devising and presenting a school shop layout idea.

Information:

1. It is quite advantageous to present a school shop layout idea in a manner that is easily understood and by the form in which it will exist. This is done by the use of 3-dimension blocks which are made to scale.
2. Such blocks may represent benches, lockers, machinery, other fixed or semiportable equipment, fixtures, and etc.
3. A code identity may be devised for each block. Such a code may be placed directly on each block. The key to the code may be placed in a convenient place.
4. A 3-dimensional block layout stresses arrangement, size and shape, and space relationships.
5. Arrangements for utilities may, upon the option of the planner, be excluded and left for further architectural consideration.
6. Models that are made to a scale of ¼ inch equals 1 foot have proved to be satisfactory. As you will note, such a scale coincides with that which is recommended for the "Template Method."
7. The materials of which models may be made are wood, metal, and plastics.
8. Where multiple floors are desired in a shop building, transparent plastics may be used satisfactorily for floors that are located above the main or ground floor. This enables the planner and observer to view all floors simultaneously.
9. Teachers, supervisors, school board members, architects, and others may use 3-dimension scale block layouts to convey ideas, check planning points, and as a reference, use for making constructive suggestions and criticisms in accordance with the principles of school shop planning and local building codes.
10. 3-dimensional blocks may be used many times.

Assignment:

See assignment sheet for this lesson

References (A list of pertinent references should appear here)

Shop Planning, Unit IV — Lesson 2
Assignment Sheet No.....
A Method of Making a Shop Plan — the "3-Dimensional Scale Block Method"

1. List four groups of physical things which may be presented by 3-dimension blocks.
   a) .....
   b) .....
   c) .....
   d) .....
2. List four factors in a shop layout that may be stressed by using 3-dimension scale blocks.
   a) .....
   b) .....
   c) .....
   d) .....
3. List three materials of which 3-dimension blocks are made.
   a) .....
   b) .....
   c) .....
4. Work out a method for identifying the blocks. (This will be used in the assignments for Unit V.)

References:

1. Information sheet, Unit IV, Lesson 2
2. (A list of other pertinent references should be added here.)

Tool Identification— Teaching and Testing

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There are many philosophies and methods pertaining to the use of tool identification in the school shop program. Some teachers feel that the student should be familiar with only those tools which he has had an opportunity to use; while others believe that the student cannot possibly use, during a specific course or while constructing a project, all of the tools and equipment with which he should be familiar. Practices and beliefs may range anywhere within these two philosophies.

It is not the purpose of this article to expound upon these theories or to attempt to identify that which the writer deems best. No matter what your theory as to the students' needs or your requirements for tool identification, undoubtedly there are times when you have wished that you had a fast, efficient way to test your students on tool identification. Most teachers who test on this subject will find it necessary to fill a box with tools, carry it to the classroom or discussion area, and then hold each tool in view one at a time, or lay the tools out on benches so that the students can circulate to identify them. Others feel that tool identification is desirable, but do not test in this area because of the inconvenience of the methods generally used.

There are some commercially prepared tests and aids, but frequently these will not fit directly into a specific shop program. See Figure 1.

A method is being used at Franklin Junior High School (in the woodworking, plastics, transportation, and foundry areas) that many may have thought about but without being able to experiment with because of lack of time and facilities. The method which you are encouraged to try is the use of projected 35mm. slides. Slides are being used very successfully for initial instruction and review as well as for testing. See Figures 2 and 3. A 35mm. projector of 300- or 500-watt output produces an image on a screen in a room that has sufficient light for the students to read and write. Testing can be done using an objective answer sheet or fill-in questions. The test may also be varied from time to time merely by altering the order in which the slides are projected. In the initial experiment black and white slides were used because they are less expensive and more easily processed in our own school darkroom. If, however, you have color-coded tool panels in your shops or a color dynamics paint scheme for machinery, etc., color slides can be made but are somewhat more expensive than black and white.

The use of slides, however, is not limited to tool identification, but has many other useful implications for your shop program. It has been encouraging for new students in the Franklin Junior High program to see color slides of projects made by previous students in the same shop with the same equipment they will be using. Similar to tool and equipment identification testing is the use of slides in the study and testing of engine parts for automotive mechanics, identification of types of architecture, etc.

Slide Production

Black and white slides are the easiest and least expensive to produce, costing about 6 cents each, mounted and ready for use. If positive type film is available, the slides can be taken directly, and when developed, merely cut the film and mount for use. Positive film, however, is usually available only in rolls of 100 feet or more. When taking only a few pictures, regular black and

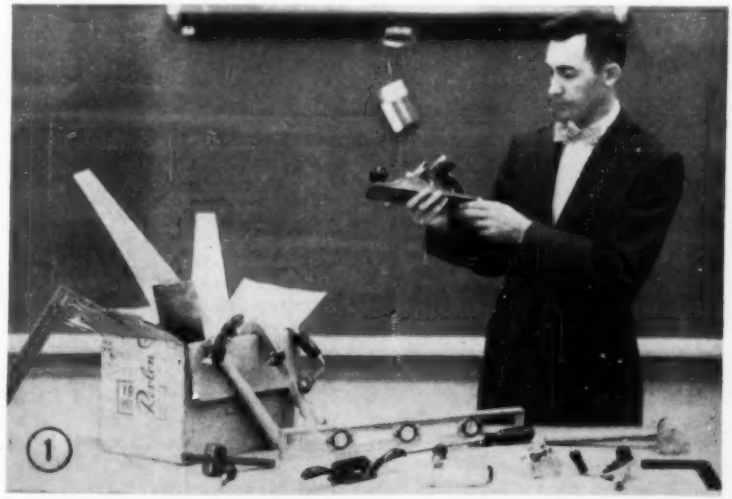

Fig. 1. A conventional method. Illustrated is one of the methods generally used for tool identification testing. This is limited almost entirely to small tools, and small equipment, and requires time-consuming preparation

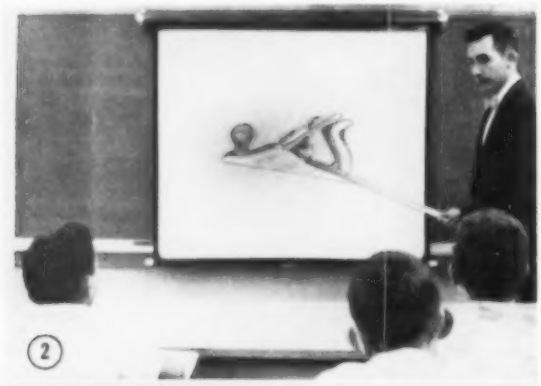

Fig. 2. Initial instruction and review. An example of using slides for initial instruction and or review of tool and machine identification (picture taken with two of the three banks of fluorescent room lights on)

Fig. 3. Testing. An example of using slides for tool and machine identification (picture taken with two of the three banks of fluorescent room lights on)

Fig. 4. Slide production. Shown, the method used by the writer to photograph hand tools and small equipment

Fig. 5. Suggested method of preparation. Shown here is the equipment needed to test, instruct, or review all tools and equipment used in four areas of work (transportation, foundry, woodworking, and plastics)

white negative film is available in 20- or 36-exposure rolls at a relatively low cost. It can be purchased with film speeds up to 200 daylight which, if used properly, can eliminate any lighting problems one may encounter when using floodlights and a lower speed film, Figure 4. Once the negatives (on negative film exposures) are developed, the film can be taken to a local photo finishing establishment to have positive (slides) made. This cost is approximately 60 cents per 36-exposure roll, but may vary according to your locality. The only other cost involved is the purchase of mounting frames which may also vary, but can be had for about 1¼ cents each. The positive film prints are then cut apart from the roll and mounted separately. When color film is used, the individual's work is reduced to merely taking the pictures, since the film is usually processed only by commercial photographic companies; but this method is considerably more expensive — approximately 15 cents per slide, mounted and ready for use. A person who may not want to mount his black and white slides, and has taken them in the order in which they are to be used and with the camera in the proper position each time, can omit the cutting and mounting by using the positive reproduction as a film strip. This also reduces cost.

Each method mentioned has both advantages and disadvantages. The writer uses black and white individually mounted slides in a semiautomatic 300-watt projector, Figure 5. This projector is powerful enough to show slides on a beaded screen with two of the three banks of fluorescent room lights turned on. Each slide has been color-coded and filed because many slides are used for two or more different area tests where types of tools in different areas of work overlap (i.e., when testing the transportation area, each slide in the file with a red code is used). Some slides are coded with four colors indicating that they are used in all areas of instruction. If care is taken, the slides can be used almost indefinitely.

•

The pentagonal (5-sided) shape of the Pentagon was suggested by the outlines of the original filled-in land upon which it was to be built. Though the contours of the land site were later changed, the shape of the building was retained because it was reminiscent of fortified towns of the Middle Ages and because the design provides the greatest area with least walk distance. — *Wisconsin Military District Information Office.*

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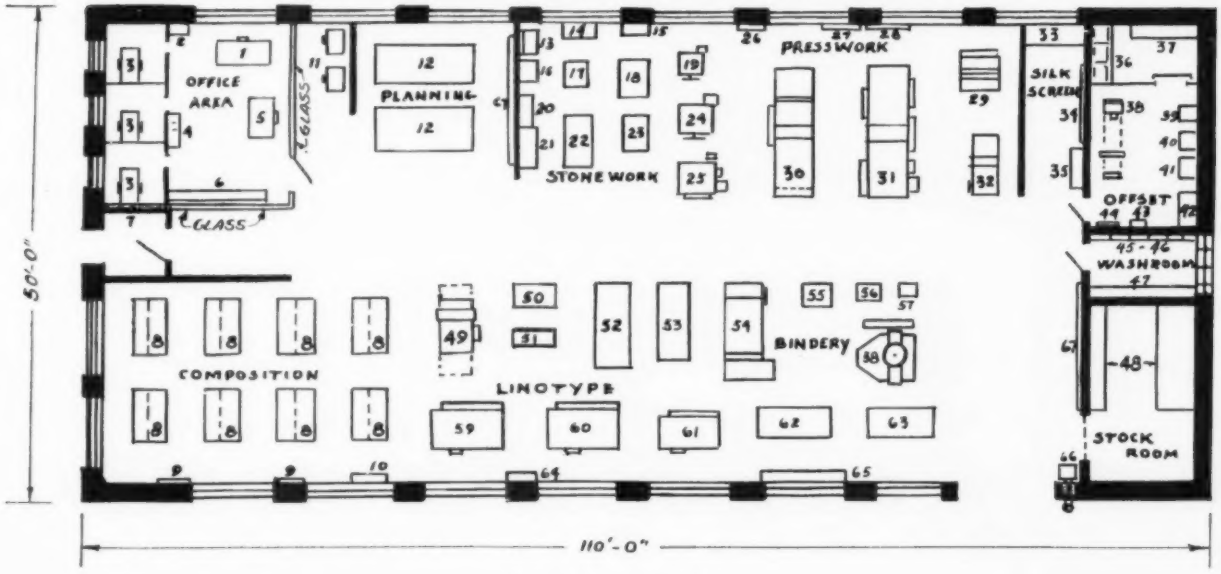
The U. S. Army was first officially known as "A Board of War and Ordnance." The Department of War was created by Congress in 1789 and remained so until renamed Department of the Army under the Unification Act of 1947. — *Wisconsin Military District Information Office.*

GRAPHIC ARTS IN THE NEW BAGHDAD TECHNICAL INSTITUTE

Article submitted by Samuel E. Russell. (See article on pages 77 and 78)



Graphic Arts Shop

1. Desk; 2. filing cabinet; 3. tables with drawers; 4. duplicator; 5. desk; 6. chairs; 7. display case; 8. type stands and cabinets; 9. panels; 10. type cabinet; 11. varitypers; 12. tables; 13. chase rack; 14. router; 15. galley cabinet; 16. furniture cabinet; 17. saw; 18. make-up table; 19. platen press, 10 by 15 in.; 20. reglet cabinet; 21. furniture cabinet; 22. stone (imposing table); 23. galley cabinet; 24. platen press, 12 by 18 in.; 25. platen press, automatic; 26. tool panel; 27. roller cabinet; 28. roller cabinet; 29. offset press; 30. cylinder press, automatic; 31. cylinder press, manual; 32. multilith press; 33. silk screen unit; 34. corkboard; 35. portable table; 36. sink; 37. table with printer, etc.; 38. camera; 39. whirler; 40. opaquing table; 41. opaquing table; 42. table; 43. vacuum frame; 44. exposure frame; 45. lockers; 46. lockers; 47. washing sink; 48. shelves; 49. proof press; 50. make-up table; 51. stone; 52. practice keyboards (Linotype); 53. portable table; 54. folder; 55. perforator; 56. drill; 57. stitcher; 58. paper cutter; 59. Linotype, English and Arabic; 60. Linotype, English and Arabic; 61. Linotype, English; 62. bookbinding unit; 63. portable table; 64. tool panel; 65. workbench; 66. remelting furnace; 67. blackboard/corkboard.

A BLUEPRINT'S MESSAGE TO A MACHINIST

ALEX ZSENYUK

Dearborn, Mich.

Here I am the product of patience,
  Experience, talent, and pride.
Use me with care,
  While as your guide.

My size and dimension
  Are shown in detail.
Be not dependent
  On the use of your scale.

Should doubt arise
  As to what you should use,
Remember
  I'm composed of multiple views.

Watch my specifications,
  My symbols will aid,
When determining
  The precision of the job to be made.

Check the angles
  Each degree and minute.
Remember each tolerance
  And every limit.

What form of heat treatment
  Will this job of ours feel?
Should we carbonize, case harden,
  Or rather anneal?

See the corners
  Along surfaces to be ground,
Each significant
  With a fillet or round.

Now that the job, partner,
  Is done as planned
I'm proud of the fact
  I was smudged by your hand.

17-YEAR REPORT ON STEEL SHIPMENTS

The steel companies of the United States shipped more than 1.1 billion tons of finished steel products from 1940 to 1956, inclusive.

Where did all that steel go? The distribution of the finished steel to the principal consuming industries and classifications went on, year by year, through periods affected by war, peace, rearmament, strikes, and other influences.

From nearly 46 million tons in 1940, the total annual shipments rose to over 83 million tons in 1956, a gain of 81 per cent.

Over the entire 17-year interval, shipments to warehouses and jobbers (excluding warehouses which serve the oil and gas industry) totaled nearly 167 million tons. The auto industry received 164 million tons. Construction and contractors' products received nearly 133 million tons.

Shipments of sheets and strip increased from 12.3 million tons in 1940, to over 29.4 million tons in 1956. Over the 17-year interval, the shipments of these products totaled nearly 328 million tons.

Additional copies of this supplement from the October, 1957, issue of *Steel Facts*, are available, free of charge, from *American Iron and Steel Institute, 150 East Forty-Second St., New York 17, N. Y.*

The Pentagon, the armed services command post, occupies 580 acres, of which 34 acres are taken by the building itself. The Pentagon's structural steel frame and reinforced concrete construction is supported by more than 40,000 concrete piles. — *Wisconsin Military District Information Office.*

Girls in the Auto Shop

MORTON MARGULES
Automotive Instructor
High School
Somerville, N. J.

Since the turn of the century American ingenuity and industry have produced more than one hundred and sixty million motor vehicles. Very shortly we shall have approximately sixty million cars and trucks on our highways across the United States. Many families today have not only one car, but two and even more, making the American people the most mobile population in the world. Aside from giving driving lessons and instructions regarding traffic regulations, what are we doing in our high schools to acquaint teen-agers with the problems involved in owning an automobile? All too many people, men as well as women, know how to drive a car, but there the knowledge of their vehicle abruptly ends.

Realizing the need for better education in this regard, Somerville High School instituted an *Auto Owners' Course* three years ago. A technical four year industrial-arts' automotive course for boys was already part of the curriculum, but this new course was designed to give Junior and Senior students, both boys and girls, a more general knowledge of the automobile in just one year. The need for this means of acquainting these students with the basic fundamentals of auto ownership was immediate, for many of the upper grade boys and girls were already driving their own cars.

A survey of the situation showed that

Figs. 1 and 2 (see Fig. 3 also). Girls and boys of the Auto Owners Class reassembling, prior to adjusting, various final drive units

Figs. 3 and 4. Young fellow in Auto Owners Class is perplexed by the ability of the young lady to reassemble the double action fuel pump with little difficulty

the new course would have to be built around the consumer angle, and not the purely mechanical. It would also have to be adapted to meet the requirements of both boys and girls in a mixed class situation. With these considerations in mind, a one year course of study was built involving the following major items:

1. Important structural and mechanical considerations when purchasing a new or used car.
2. Features of good financial planning as against time payments and long term indebtedness.
3. Insurance, as it particularly applies to drivers under 25 years of age.
4. Lubrication and other preventative maintenance including the purchase of gasoline, oil, tires, and anti-freeze.
5. Mechanical components of the automobile, their relationship to each other, and their construction and adjustment.
6. The electrical system, simple check points and adjustments.
7. The fuel system, its construction, and very minor repairs and adjustments that can be made without instruments.
8. Principles of wheel alignment.
9. Brake maintenance and adjustment.
10. Body and paint care.
11. Interior cleaning and care.
12. Career opportunities in the automotive field.

As these major topics of our course of study were pursued, it developed that there were no special problems because of the mixed class situation. A spirit of co-operation between boys and girls and of personal good will toward each other prevailed throughout every step of the work. When work on a unit necessitated protecting school clothing, boys donned coveralls and girls wore either smocks or shop coats. The auto-

Fig. 5. This group has just finished cleaning the carbon off one of the heads of this V8 engine. They are now replacing the head and bolts and applying the proper amount of torque

Fig. 6. The girls in the class have shown outstanding ability when working on such units as the fuel pump, carburetor, and distribtuor

matic car lift in the shop made it unnecessary for anyone to crawl underneath a car.

To broaden the scope of the course, outside experts were brought in to discuss such topics as insurance and financing. Trips were made to new and used car dealers, to tire recappers, and to assembly plants. Informative films and technical film strips were used to supplement the work on the various units in the shop.

After three years this course has become an integral part of the high school program. Unfortunately, many who desire the course cannot fit it into their schedules. Those who have taken it, however, feel that the knowledge gained has been of immense value to them in their own car ownership. The information of the basic mechanical units has served as an increased safety factor, because dangerous conditions are more apparent and are, therefore, given prompter attention. The young auto owner can also save on the cost of service by detecting and easily repairing or adjusting minor troubles without the help of an expert. Actually the course has become a dollar saving program, and this is not a fact to be looked upon lightly with auto owners in the country spending close to forty billion dollars a year to operate their cars.

Fig. 7. Teaching carburetor adjustment was never more pleasant than showing the youngsters of the Auto Owners Class

Tool Storage in the Woodshop

BROTHER LEO GEIGER, C.S.C.
Industrial Arts Department
St. Edward High School
Lakewood, Ohio

Not every shop teacher will agree on the one best method for making tools available to students for use in the shop. Some prefer the tool crib or tool room where all the tools are supplied as the need arises through a system of check-out tags. This affords a constant check on the whereabouts of all the tools; but much time is lost as students must wait in line for the tools at the beginning and end of the shop period as they are being checked out and in. One student is usually placed in the tool room throughout the shop period eliminating his ability to work during this time. In some situations, the tool-room method is the only desirable system to use.

Some shop teachers prefer the system of having all the basic tools in individual drawers, lockers, or tool boxes and assigning one or more students to each set of tools. This system also has merit and is highly desirable, especially in a vocational shop. For general industrial-arts work, however, this system requires an unnecessary duplication of many tools which are commonly used but not necessary for each student.

The open-tool rack has become more acceptable during the past few years. In this system, all the more common tools are mounted on a panel or in a cabinet, which should be more or less centrally located in the shop for easy access. Each tool should be mounted

Fig. 1. Tool rack when open during the class period

so that it will be within easy reach of the students and its absence can be detected at a glance. Some instructors prefer to paint silhouettes back of each tool to aid in detecting tool absence. With or without the painted background, if each tool is mounted in such a way that no other type of tool will fit, there is less likelihood of misplaced tools. The use of hooks and eyes, pegs, or metal clips, therefore, are undesirable. They also tend to give a less professional appearance to the finished tool rack.

One system which has been successfully used with the open-tool rack is the assigning of one student as *toolman*. This assignment can be made in conjunction with the regular shop clean-up program or separately as may be desired. At the end of each class period the toolman checks to see that all tools have been returned to their proper place on the rack. Any missing or broken tools are reported to the instructor immediately so that proper measures may be taken before the class leaves the shop. The toolman also is responsible for keeping the tool rack neat and clean, free of all collected dust and

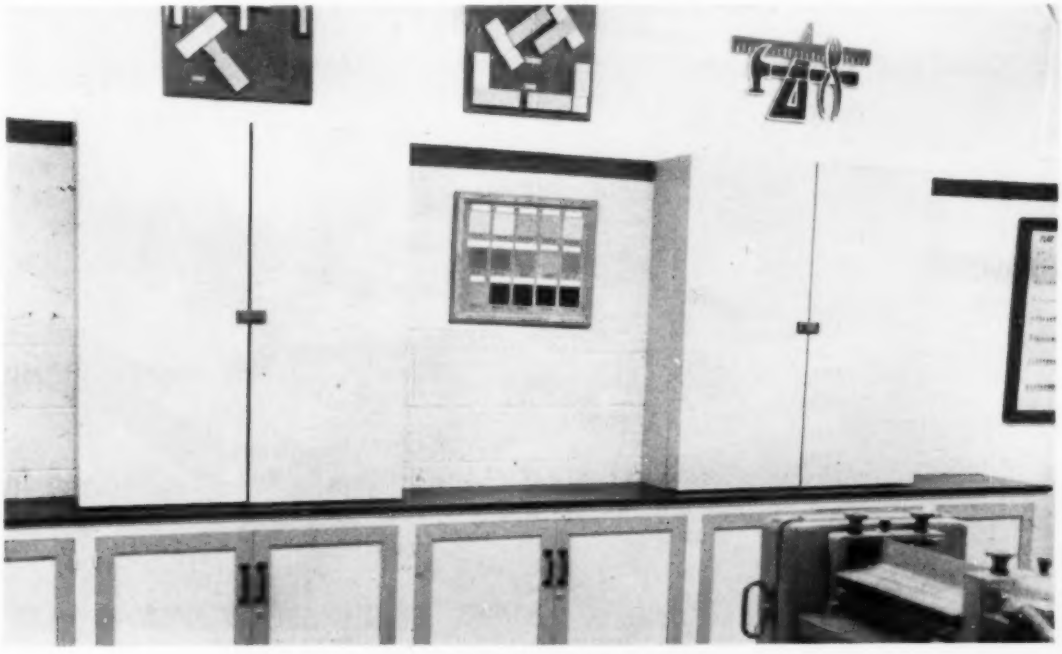


Fig. 2. The tool rack when locked

chips. To test the accuracy of the tool check, the instructor may occasionally remove a small inconspicuous tool to see if it is missed during the toolman's inspection. This technique tends to cause the one in charge of the tool rack to be more precise and alert during his check.

Care must be exercised when attempting to mount the various tools so that each is visible and individually recognizable and that excessive space is not used for the rack. Tools can be scattered over a flat panel so that vast areas are needed for the tool rack. The opposite is equally undesirable. If tools are mounted too close together the cramped condition detracts from the over-all appearance. However, in attempting to arrive at a mean between wasted space and a cramped condition, it is necessary to consider future expansion as well as the acquisition of additional tools.

The Figures 1 and 2 show an example of an open tool rack designed to be highly functional and attractive. The complete storage unit includes storage cabinets and display case in addition to the tool rack. The complete tool rack is composed of two large sections separated from each other to allow room for the opened doors on which are mounted some of the less heavy tools. When both cabinets are fully opened, the rack appears as one large display.

Supplies and equipment are stored in the cabinets under the tool rack. A glass-door display case is used to exhibit small projects as well as the shop library. The counter under the tool rack is useful when replacing tools on the rack. Once all the tools have been replaced and an accounting for them made, the complete rack can be closed.

Grand Avenue Junior High School

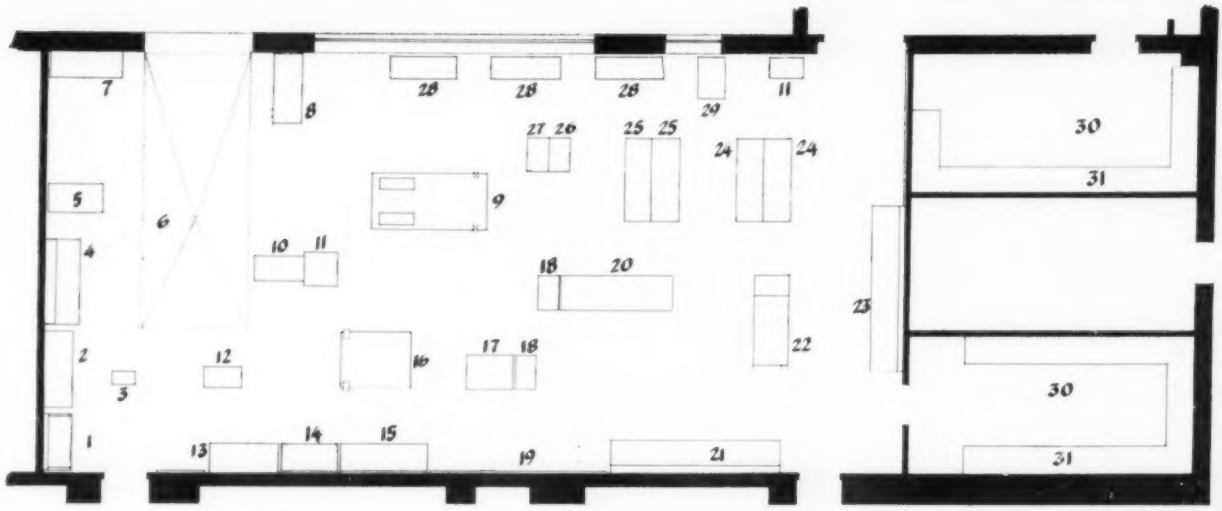
JULIUS C. BRAUN
District Principal, Central High School
District No. 3
Bellmore-Merrick, L. I., N. Y.

The Grand Avenue Junior High School, with a rated capacity of 1200 students, will be the third identical building for housing grades 7, 8, and 9 in the Central High School District No. 3 located in the Bellmore-Merrick area on Long Island, N. Y.

A broad industrial-arts program is offered in order to give a breath of exploratory experiences and to prepare pupils for experiences of later adolescence. As part of a comprehensive junior high school experience instruction is provided in industrial arts which rotates all pupils through three shops during their 7th and 8th grade experi-

Grand Avenue Junior High School, Bellmore-Merrick, L. I., N. Y.

— Frederick P. Wiedersum Associates, architects



Grand Avenue Junior High School, Metal and Electric Shop

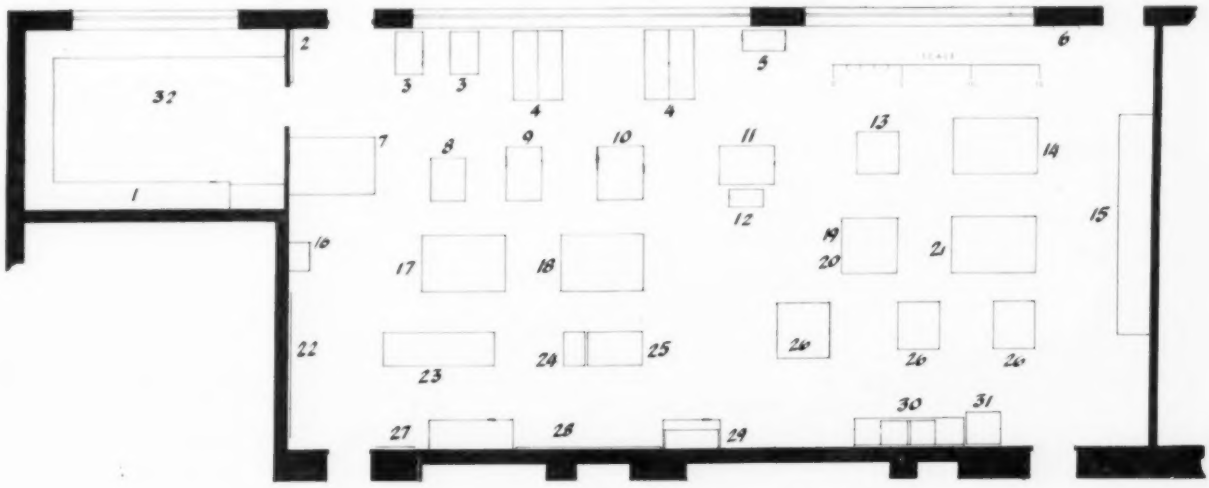
1. Foundry bench; 2. furnace unit; 3. anvil; 4. soldering bench; 5. auto engine; 6. automobile space; 7. general storage; 8. bench with drawer and vise; 9. art-metal stake table with vises; 10. power hack saw; 11. drill press; 12. outboard engine; 13. sink; 14. electroplating bench; 15. storage; 16. plumbing bench with vises; 17. desk; 18. file; 19. tool panel; 20. planning table; 21. electrical testing and construction bench; 22. lecture table; 23. lighting and household appliances; 24. power generation (dry cells, wet cells, motors, generators); 25. transportation of current — batteries — transformers — rectifiers; 26. sander; 27. buffer; 28. metal lathes; 29. jig saw; 30. storage room; 31. shelving.

ence with classes meeting daily for one term during each year. In the 9th grade comprehensive general shop may be elected with pupils attending class daily for a full year and rotating through three shops covering six areas of industrial work.

Woodworking and ceramics are taught in the same shop, metalwork and electricity in another, and printing and textiles classes are taught in a third shop.

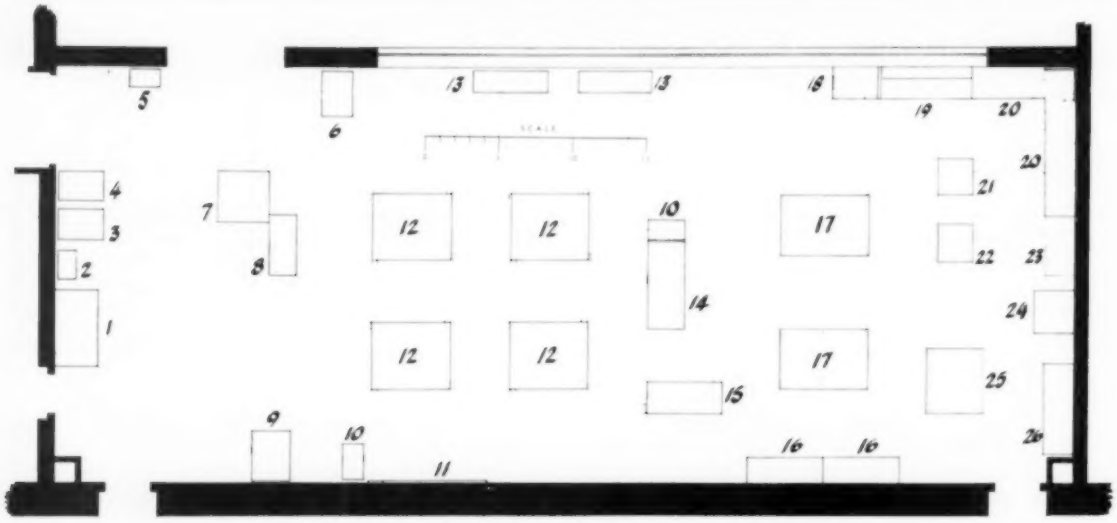
The three shops as designed and equipped are herewith shown together with their related storage areas. The shops themselves approximate 2000 square feet and are about 32 by 64 ft. Interconnecting doors are provided between shops for ease of department operation. Outside doors, both overhead and regular, are provided to facilitate delivery of supplies and equipment. Equipment is varied and arranged so as to provide a comprehensive industrial-arts experience on the junior high school level.

The architectural firm responsible for the unusual design of the Grand Avenue Junior High School is Frederic P. Wiedersum Associates, Valley Stream, Long Island, N. Y.



Grand Avenue Junior High School, Printing and Bookbinding

1. Shelving; 2. tool panel; 3. lever press; 4. type case; 5. sewing machine; 6. ironing board; 7. bindery bench; 8. press room cabinet; 9. worktable; 10. imposing table; 11. proof press; 12. galley rack; 13. warp reels; 14. textile worktable; 15. wall bench; 16. stitcher; 17. silk screen printing; 18. block printing; 19. spool rack; 20. kop winder; 21. looms and card weaving; 22. bulletin board; 23. planning table; 24. file cabinet; 25. desk; 26. floor looms; 27. bookbinding table; 28. chalkboard; 29. storage; 30. dye sink; 31. washing machine; 32. storage room.



Grand Avenue Junior High School, Wood and Ceramics Shop

1. Glue bench; 2. miter saw; 3. drill press; 4. jig saw; 5. grinder; 6. band saw; 7. circular saw; 8. jointer; 9. desk; 10. file; 11. tool panel; 12. locker benches; 13. wood lathes; 14. planning table; 15. demonstration bench; 16. storage; 17. workbenches; 18. bench for ball mill; 19. finishing bench; 20. ceramics bench; 21. potter's wheel; 22. electric wheel; 23. drying shelves; 24. kiln; 25. stacking bench; 26. sink.

General Shop and Farm Shop At the New Milan Area School

EDWARD BEVIER
Industrial Arts Department
Milan Area Schools
Milan, Mich.

This article presents the floor plans and equipment layout of the new Milan Area Schools General Shop. The shop is now under construction and will be ready for occupancy the second semester of the school year 1957–58.

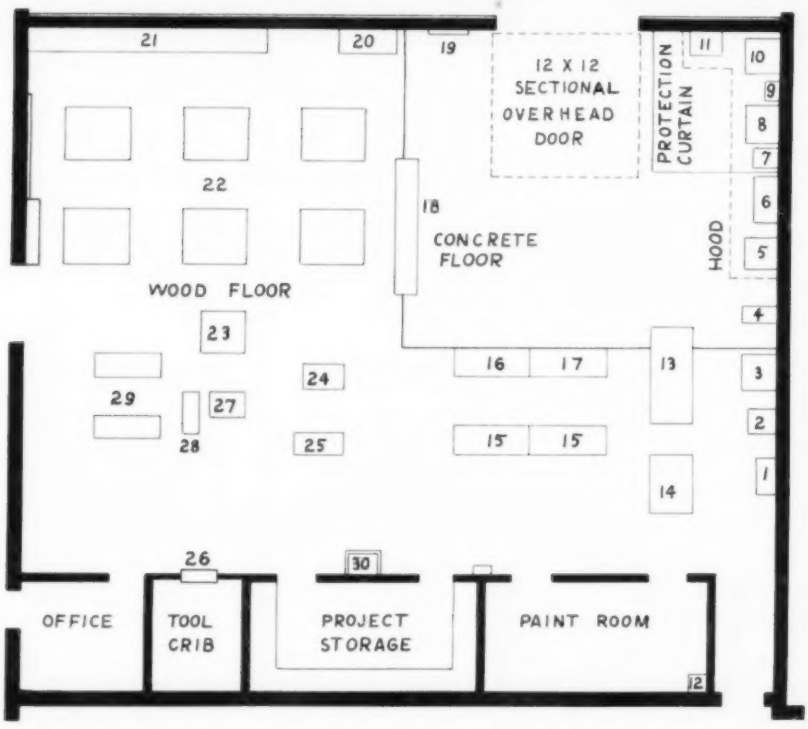
This shop was planned with the joint co-operation of the architect, administration, shop teacher, and farm shop teacher, resulting in complete agreement on the final plans.

The over-all size of the shop is 65 by 65 ft. It is planned for work stations of 24 students per class for a six-period day under a general shop program, or 30 students in hand and machine woodwork, with a 16-student farm shop class running concurrently. A separate drafting room will be available to accommodate 16 students six periods a day. The area above the office, tool crib, project storage, and paint room is to be used for stock storage.

The equipment for the shop is included in the general contract under the specifications set up by the shop teacher and farm shop instructor. With this method of procurement a school district will get quality equipment and service for the minimum expenditure due to competitive bids. With the present high cost of equipment it is essential for a school district to receive full value for the public's money. The total cost of equipment for the shop and drafting room including hand tools is approximately $20,000.

The areas of work to be taught in this shop will be as follows:

1. Hand and machine woodwork
2. Farm shop
3. Welding and casting
4. Metalwork (machine and hand)
5. Electrical
6. Finishing and drafting.



1. Polishing unit; 2. drill press; 3. vertical mill; 4. metal working sharpener; 5. crucible furnace; 6. foundry molding table; 7. gas forge; 8. gas welding table; 9. pedestal grinder; 10. arc welding table; 11. electric welder; 12. fan — 2; 13. sheet-metal bender, 96 by 40 in.; 14. machine bench, 60 by 40 in.; 15. metal lathe — 2; 16. metal bender; 17. sheet-metal assembly and soldering; 18. repair bench; 19. mechanic's tool set; 20. electrical bench; 21. storage; 22. 45 WWB — 6; 23. 10-in. tilting arbor; 24. jointer; 25. combination sander; 26. Dutch door; 27. band saw; 28. jig saw; 29. wood lathe — 2; 30. S.S.

With this fine layout and equipment each student has an opportunity to obtain and practice the best in general shop procedure.

EXTEND THE LIFE OF YOUR AUTOMOTIVE STORAGE BATTERY

FRANK P. PLOVICK
Field Service Manager
Delco-Remy Division
General Motors Corporation
Anderson, Ind.

Accumulated grime and corrosion on automotive storage battery tops and terminal clamps may cause excessive self-discharge while the car is parked.

Cleaning the top terminal clamps with a heaping teaspoon of baking soda dissolved in a quart of water will extend effective service life. The soda solution should be brushed on until all foaming stops, then it should be rinsed off with clear water. A light coating of petroleum jelly on the terminal clamps completes the job. The only precaution necessary is to see that none of the soda solution gets inside the battery.

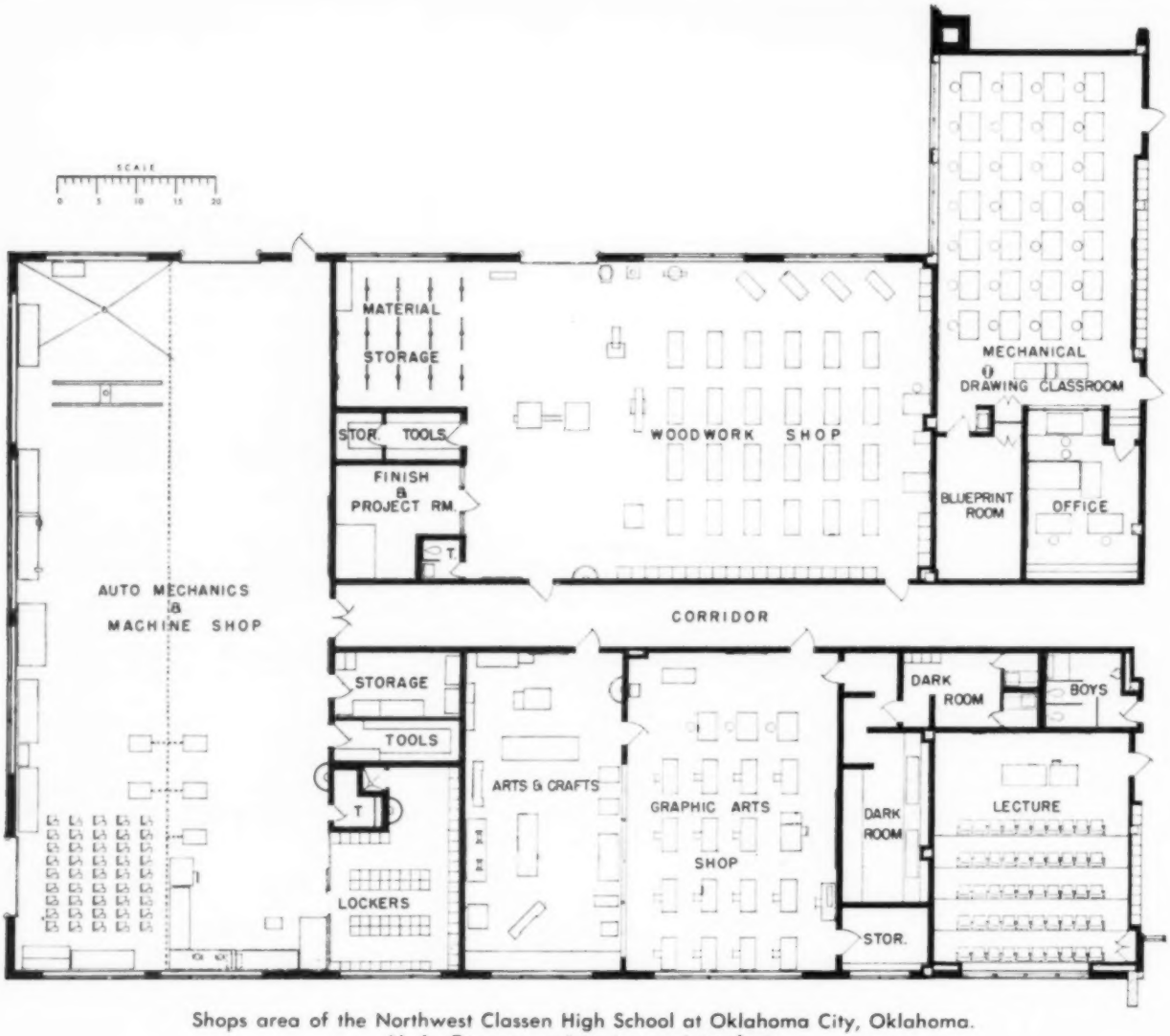
After a cleaning like this, many a car owner is surprised to find that a battery he thought was about worn out is still capable of holding a charge.

Oklahoma City "Northwest Classen Shops"

N. L. GEORGE
Assistant Superintendent of Schools
Oklahoma City, Okla.

Teachers, counselors, and school administrators were the members of committees who were organized to determine the various needs of Northwest Classen High School in Oklahoma City.

The school administration and the school committees considered the general area of Oklahoma City and the types of students to be accommodated. They concluded that the program should be basically college preparatory. Variations were to be allowed to fit the needs of all students in this section of Oklahoma City. The planning committees began to study specific subject areas needed and the building needs to accommodate the desired program. In the subject area of industrial education, the committee recommended that shops be provided for drawing, woodworking, arts and crafts, graphic arts, and a shop for automobile mechanics.



Shops area of the Northwest Classen High School at Oklahoma City, Oklahoma.
N. L. George, assistant superintendent.

The graphic arts program was designed to provide for photography, printing, and some mechanical drawing. The automobile shop was to provide general automobile mechanics and some basic machine shop, primarily relating to the automotive industry. The above planning served as the next step which was to study space requirements for each shop, the interrelationship of shops, and their relationship to the other sections of the proposed building. The building site and the accessibility desired from the adjacent streets and parking areas were important considerations.

The committee recommended that the building plans provide areas for the shop program in a wing as an integral part of the school plant. The design of the shop wing is a simple one-story structure accommodating the above-mentioned shops, and a combination class and projection room. Adjacent are the distributive education classroom, diversified occupations classroom, custodial workroom, boiler room, and one added room which is being used at present as a commerical department laboratory. This room will provide an additional shop space for future needs, possibly electronics.

This shop wing has a corridor running completely through one leg of the ell with doors on each end which are student exits. These doors open to the sidewalks leading to corridors of the main building. Classrooms are located on both sides of this corridor, which house activities that would be quieter than such shops as woodworking and automobile mechanics.

The other ell of this shop wing has shops on both sides of the corridor and the automobile shop at one end. It is perpendicular and joins the corridor of the first ell mentioned above. Overhead doors are provided for the automobile shop and woodworking shop which open to school parking areas and are very accessible from streets.

The location of the shop wing eliminates the disturbance of shop noises which would circulate to the other sections of the school plant. The shops can be used as a separate unit for evening school, without opening the other parts of the school plant for this activity.

Detailed plans were developed in studying space and other requirements for each shop. First consideration was given to the spaces needed for each shop. Shop noises were considered. Finally, the general floor plan was determined. In developing individual shop space needs, detailed shop layouts were

developed. These layouts were developed to include shop working space, storage space, classroom areas within individual shops, tool rooms, locker rooms, toilets and washrooms, lumber storage, finishing rooms, darkrooms, teacher offices, display spaces, chalkboard areas, washing areas, and other space requirements as were desired for each shop. In order to make the individual shop layouts, detailed lists of equipment were developed and space requirements for each determined. The next step was to determine the best possible arrangement in the shop. In making this determination, consideration was given to safety, working convenience, lanes of travel, student congestion, housekeeping, education efficiency, supervision, use of natural light, ventilation, storage, accessibility of doors, utility requirements, waste disposal, and other determining factors for individual shops.

These layouts served as a basis for determining lights and electric power requirements, as well as water, gas, air, and some ventilating requirements which were stipulated in the project plans and specifications which were contracted.

Special Area Features

Lecture Room. The lecture room features permanent seating, arranged in rows, each row at different levels to provide the best viewing of the front of the room. It also features display space for visual materials, storage space for projects, motion pictures and filmstrips, and wall space for charts and mock-ups. This room is equipped with 32mm. projector, screen and filmstrip projector, and other items for demonstration purposes. Daylight control is regulated by metal louvers.

Graphic Arts. These rooms feature two darkrooms equipped with storage cabinets, darkroom safe lights, forced ventilation, workbenches, film loading rooms, and stainless steel sinks and acid-resistant cabinet tops. The classroom for this program has permanent built-in storage cabinets. Since this is a general graphic arts shop the classroom is equipped with drawing tables, and is adequately lighted to provide the maximum light needed. The drawing and photography section of this shop area is separated from the printing area by a wall which features windows that permit supervision from all points in both areas. The printing area is presently used as an arts and crafts shop. This action is necessary because a qualified teacher to instruct in photography, drawing, and printing has not been located. When a teacher can be secured, the arts and crafts shop will be moved to other quarters in the school plant and the graphic arts program will be put in operation as originally planned.

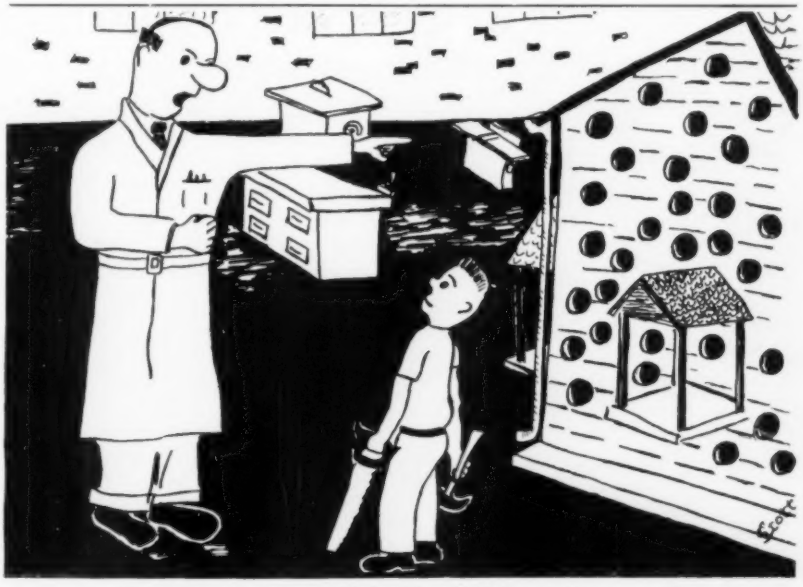
Woodworking Shop. The features include a fireproof finishing room equipped with spray booth, exhaust fan, and spray painting equipment. Metal storage cabinets are provided for storage of finishing materials. This shop is also equipped with a dust collecting system composed of fan, ducts, and other apparatus to collect sawdust from each machine. Lumber and project storage, as well as tool and supply storage rooms, are featured in this shop. Individual student storage cabinets are provided to avoid confusion regarding student materials. This woodshop has a wood floor, whereas other shops have concrete floors. To eliminate slippage, which is a problem in a woodshop particularly around machines, the entire floor is made of 2 by 4-in. yellow pine set on ends. This shop has 24 single woodworking benches, band saw, jointer, shaper, table saw, surfacer, four lathes, mortiser, grinder, and other minor equipment and needed hand tools.

Automotive Shop. The features are fans and underfloor ducts to exhaust fumes from combustion of automobile engines, monorail and chain hoist, hydraulic hoist, electric test bench, tool and supply storage rooms, a locker room enclosed on three sides by walls and on the fourth side, adjacent to the shop, by wire mesh. This locker room has a shower, semicircular wash basin and steel student lockers.

This entire shop area is heated by overhead steam heaters. Intakes bring fresh air from the outside through these forced air type heaters. This arrangement is a safety feature needed in automobile shops to allow replacement of air needed to permit exhaust gases to be discharged through the suction fan and ducts provided for this purpose.

Drafting Room. The features include a raised glassed-in combination office, workroom, and storage cabinet space for teacher's use. It is arranged to provide good supervision of students while providing privacy for individual counseling and planning. The oak drawing table in this room was built in one of the Oklahoma City vocational shops and features a top made of ¾-in. plywood covered with linoleum and edges trimmed in oak. This feature eliminates the need for drawing boards and thumbtacks, instead masking tape is used which is easily removable from the white linoleum. This linoleum is easily cleaned with soap and water and after two and one-half years' use is in excellent shape. This feature was an experiment insofar as to ascertain whether or not these tops would prove satisfactory. There was the question as to what students would do to these tops with instruments that had sharp needle points. Experience with this kind of table top reveals that the needles could be ground sharp but blunter than when new and, with good instruction, practically eliminate all damage to the tops.

Students are proud of the good shops and equipment available for them. These shops look as good as new after two and one-half years and the administration feels they can expect to maintain these well-kept shops in a very satisfactory manner.



"Sure I said you could build a birdhouse but . . . !"

— Calvin T. Stott, instructor of industrial arts, Hanover High School, Hanover, Pa.

New Albany Junior High School Foundry Area

JOHN F. SEVILLE
Instructor, Metals and Electrical Shop
Junior High School
New Albany, Ind.

One of the most popular areas of work in the industrial-arts department is the foundry area. Foundry work is a completely new experience for most boys of the junior high age. Because of the interest in and the attraction of the foundry, boys are able to achieve satisfying results. A boy who finds it very difficult to measure a line to a given dimension or read a micrometer, frequently has less difficulty in making a satisfactory mold. At the same time, there is so much activity in the foundry that it tends to keep the boy busy to the point where he realizes that he must make the most of every available minute. This is brought out in that molds are rammed, poured, castings cooled and examined, and the foundry cleaned up in 48 minute periods. For many boys this is their first taste of real work experience. Boys of the junior high age are, by nature, very enthusiastic, and with proper orientation and instruction make pleasant and happy foundry workers.

Foundry is one of four basic areas offered in the metals and electricity general shop. The other areas are sheet metal, bench metal, and electricity, with a limited time spent in electric arc welding, turning on the lathe, and radio. With sheet metal and electricity combined it is possible to divide the class into three groups and rotate these groups each six weeks. There are usually about 6 boys per group.

The foundry itself has 280 square feet (14 by 20 ft.) of floor space with additional space for the crucible furnace, tool rack, slag bin, re-melt bin, and finishing bench. The area is partitioned from the rest of the shop with a concrete block wall 8 in. thick, and 42 in. high. The entrance to the foundry is four feet wide and has built into the floor a 12 by 24 by 48 in. pit, covered with a heavy steel grating. This helps in keeping an excessive amount of sand from being tracked onto the shop floor.

Two molding benches, each 20 ft. long, run the length of the foundry and are set out 12 in. from the walls. At each of 8 work stations is found a bellows, double end spoon, trowel and bench rammer. Located at the extreme end of the foundry area is a tool panel which holds the sprue pins, vent wires, strike-off bars, gate cutters, lifting pins, face shields, and asbestos mittens. See Figure 1.

A No. 16 crucible is used in the gas fired crucible furnace. Above the furnace are a hood and exhaust fan. See Figure 2. The finishing bench is 20 feet long and has 6 work stations with a vise at each station. See Figure 3.

Foundry patterns are kept on the ledge of the 42-in. partition separating the foundry from the rest of the shop. Since aluminum castings are used as patterns it has been the experience of

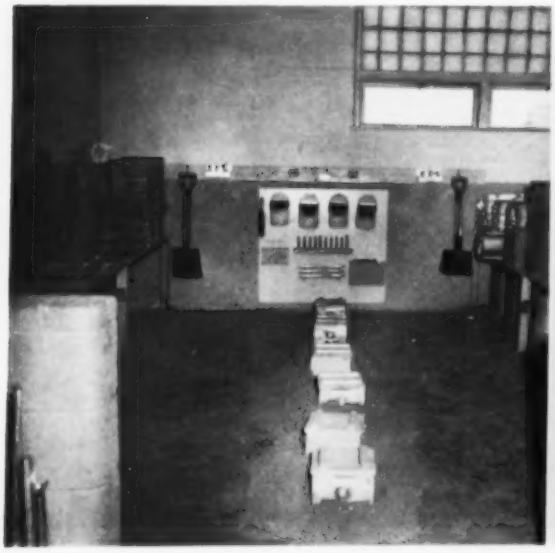


Fig. 1

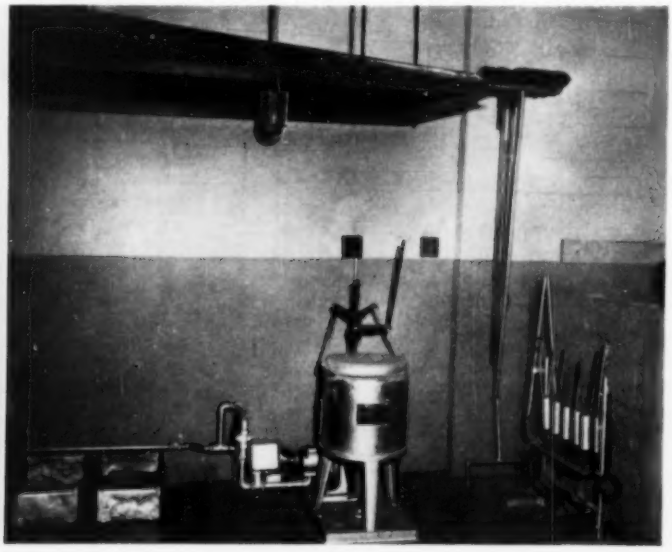


Fig. 2

Fig. 3

Fig. 4

the author that some provision must be made to distinguish the patterns from finished castings made by the boys. Substitutions are sometimes made if this is not done. By painting all patterns red and by numbering them on the back with corresponding numbers on the ledge where they are kept there is little likelihood that patterns will be misplaced or substituted for other patterns.

As each new group of boys rotates into the foundry area they are given one of six important jobs dealing with the preparation and pouring of the metal. They are: (1) charge the furnace, (2) fire the furnace, (3) locate pouring shank for pouring and clean the slag from the molten metal, (4), (5), and (6) two boys man the pouring shank with the third boy holding the crucible in the pouring shank when running a heat. The three boys assigned to run the heat always wear face shields and mittens and are the only boys in the foundry area at this time. See Figure 5. Each of the jobs mentioned, gives the boys a feeling of responsibility in running a heat for each has to do his job safely and thoroughly. In addition to these jobs each has a clean-up assignment.

Each boy is instructed how to temper the sand and how to make a mold. See Figure 4, making a mold. The first molding assignment requires a pattern consisting of a rectangular block with tapered sides. The importance of draft on a pattern is discussed at this time. Additional patterns used are: (1) solid, (2) flat back, (3) irregular, (4) thin, and (5) patterns requiring coping. Since the patterns are graduated according to difficulty, assignments are made using the easier patterns first and then graduated to the more arduous ones.

All molds that have been rammed during the class period are placed on the foundry floor. There is always an attempt to align the sprue openings in the molds when they are placed on the floor as this helps in the running of the heat. After placement of molds on the concrete floor, sand is shoveled around each mold and a shallow trench made in the sand. In case of over pouring a mold the trench prevents the molten

Fig. 5

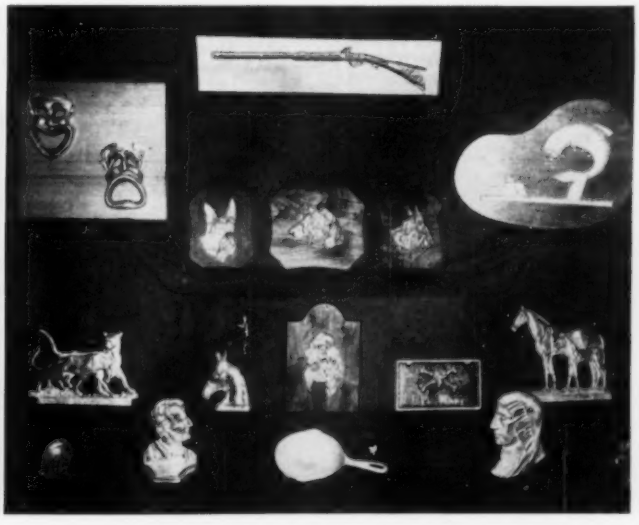


Fig. 6

metal from running onto the floor. See Figure 5, pouring molds. A minimum number of three molds must be ready before a heat is run. Castings are made of nonferrous metals, namely aluminum.

Immediately after pouring the following procedure is used: (1) the sand is shoveled from around the mold, (2) the cope and hot casting are lifted from the drag and turned upside down in the sand under the molding bench, (3) while casting is cooling the drag is placed under the molding bench and the sand rammed from it, (4) molding boards are then put in their proper location, (5) the sand and casting are rammed from the cope, (6) cope and drag are placed together and stacked, (7) tongs are used to pick up the hot casting which is then quenched in water, and (8) casting is then removed from water and examined.

Satisfactory castings are taken to the foundry finishing bench where the gates and sprues are sawed from the castings. After filing, the castings are cleaned with rotating wire brush and then buffed with tripoli. The tripoli, serving as a fine abrasive, leaves a highly polished appearance on the face of the casting. See Figure 6, display of foundry projects.

Each boy is issued a foundry work sheet when entering this area and it is his responsibility to record on this sheet the work he does each day. This work sheet is used at the end of the six weeks period to help evaluate his work in terms of a letter grade.

The ultimate objective is that at the end of this six weeks period each boy will have a much greater appreciation for the metals industry and will be able to understand more clearly the tremendous importance the foundries throughout our country play in the building of automobiles, airplanes, engines, and many parts of the machinery which has and is helping to make us a strong industrial nation. In addition to the ultimate objectives a few of the specific objectives are: (1) to develop industry and skill, (2) to develop a better understanding of foundry processes and products, (3) to develop an understanding of materials used, (4) to encourage "shop talk" (correct terminology), (5) to develop initiative and responsibility, and (6) to work co-operatively.

We have in New Albany two small foundries and a company which specializes in the production of wrought metal gifts for all occasions. This company is recognized internationally for its originality and quality merchandise. They do all of their own designing, pattern-making, molding, casting, and finishing. The significance of the foundry area as a part of the shop program can be seen in that the boys now working in this area may some day be well-qualified employees of this company.

TERMINOLOGY OF ADVANCED DRAFTING

EDWARD BARSKI

Instructor, High School

Stillwater, Minn.

Matching Test

Directions: Fill in the space before each statement with the letter of the term or phrase which best applies to the definition statement.

A. Circular Pitch	F. Thickness of the Tooth
B. Diametral Pitch	G. Dedendum
C. Pitch Diameter	H. Outside Diameter
D. Pitch Circle	I. Root Diameter
E. Addendum	J. Whole Depth

...1. Addendum plus dedendum.
...2. Circle of contact in gears.
...3. Measured along the pitch circle.
...4. The diameter of the pitch circle of a gear wheel.
...5. Number of teeth divided by pitch diameter.
...6. Circumference of the pitch line.
...7. Distance from pitch circle to outside of the gear.
...8. Often referred to as *pitch*.
...9. Equal to addendum plus clearance.
..10. PD — 2D (Pitch Diameter minus two Dedendums).
..11. Equal to one half of circular pitch.
..12. Diameter of the root circle.
..13. Distance from a point on one tooth to the same point on the next tooth measured along the pitch circle.
..14. Distance from pitch circle to outside circle.
..15. Equal to height of gear tooth.
..16. Equal to the pitch diameter minus twice the dedendum.
..17. Equal to the pitch diameter plus twice the addendum.
..18. Distance that the gear tooth extends below or inside pitch circle.
..19. Pitch circumference divided by twice the number teeth.
..20. Diameter of the greatest circle which contains the tops of teeth.
..21. Constant 1.157 divided by diametral pitch.
..22. Distance that gear tooth extends outside the pitch circle.
..23. Twice the addendum plus the clearance.
..24. Addendum plus clearance.
..25. Pitch diameter minus (twice the addendum plus 2 clearance).
..26. Distance from pitch circle to bottom of the space between teeth.
..27. Pitch circumference divided by the number of teeth.
..28. Ratio obtained by dividing the number of teeth by the pitch diameter.
..29. Equals $\frac{1}{DP}$ ($\frac{1}{\text{Diametral Pitch}}$).
..30. Number of teeth on gear for each inch of pitch diameter.
..31. Corresponds to diameter of the rolling wheel that is replaced by the gear.
..32. (π) 3.1416 × pitch diameter.
..33. Number or index to the size of the teeth.

Problems: State the formula, then work the problem using the formula correctly.

1. A gear has 17 teeth, the pitch diameter is 8½ inches. What is the diametral pitch?
2. What is its addendum?
3. There are 48 teeth on a gear; the pitch is 10. What is the pitch diameter?
4. What is the outside diameter of the above problem?
5. A gear has 30 teeth; the pitch is 6. What is the pitch diameter?
6. What is the root diameter of the above problem in inches?
7. Give the formula for the number of teeth on a gear.
8. What is the formula for finding the pitch circle?

KEY

1. *J*	18. G
2. *D*	19. F
3. *A* or *F*	20. H
4. C	21. G
5. B	22. E
6. D	23. J
7. E	24. G
8. B	25. I
9. G	26. G
10. I	27. A
11. F	28. B
12. I	29. E
13. A	30. B
14. E	31. C
15. J	32. D
16. I	33. B
17. H	

Problems and Formulas

1. $DP = \frac{N}{PD}$; $\frac{17}{8\frac{1}{2}} = 2$ =
2. $\frac{1}{DP} = \frac{1}{2}$ =
3. $PD = \frac{N}{DP}$; $\frac{48}{10} = 4.8$ =
4. $OD = \frac{N+2}{DP}$; $\frac{48+2}{10} = \frac{50}{10} = 5$ =
5. $\frac{N}{DP} = \frac{30}{6} = 5$ =
6. PD — 2D; $5 - \frac{2.314}{6.000} = 4\frac{29}{75}$ =
7. $N = PD \times DP$
8. $\pi \times PD$ or $\frac{N}{P} \times \pi$

PREPARE . . . your students for each new project

VISUALIZE . . . the problems they will encounter

DEMONSTRATE...how these problems can be solved

EMPHASIZE . . . the correct procedures to be used

SHOP SAFETY
WOODWORKING
BENCH WORK
WELDING
MACHINING
ENGINE LATHE
AUTOMOTIVE MECHANICS
TECHNICAL LETTERING
AIRCRAFT MECHANICS
SHOP DRAWING
MECHANICAL TRAINING

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Fibre-glass makes this new welder

SHOCKPROOF! NOISELESS!

IDEAL FOR CLASSROOMS... SAFE—SILENT

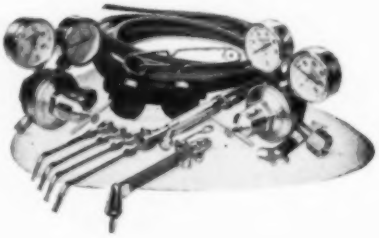
Marquette's new 90 Series Welder is best for classrooms because it is shockproof, noiseless and makes arc striking easier. Why? The welder is enclosed in tough, durable fibre-glass which is *non-conductive!* The "Perma-Shield" cabinet eliminates eddy current losses, noisy vibrations and shock-danger. This new welder is ten per cent more efficient and provides improved arc striking characteristics . . . advantages that teachers and students alike will welcome.

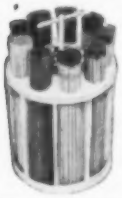
That's not all! The fibre-glass cabinet is rustproof, colorproof, waterproof and moisture proof. It's stronger than steel but lighter in weight and practically indestructible. The entire welder is best for training purposes because it's easier to operate (heat taps are clearly marked and safe, positive and easy to select), it's built to last longer and it will always keep its new appearance.

Two sizes in four models are available. One delivers a maximum of 200 amperes; the other, 275 amperes and each is available capacitor equipped, for increased power factor.

WHAT DOES ANODIZED ALUMINUM MEAN TO WELDING TORCHES?

It's new and Marquette's got it! Oxy-acetylene welding torches made of *anodized aluminum* make them 50 per cent stronger and 50 per cent lighter. Precision made, they're practically unbreakable and will stand years of rough handling. Makes them perfect for training schools. Eliminates factory service because they're equipped with fast change O-ring seals. Simply replace worn seals with new ones and the torch is ready for action in minutes time. Three models (Aero-Jet, Star-Jet and Super-Jet) are available for welding and cutting all thicknesses of metal.





WHAT KIND OF ROD DO YOU WANT?

Marquette makes a welding electrode or gas rod for every welding application. From its famous No. 130 Red Rod for getting deep penetration in dirty, rusty metal to its No. 15 Presto-Arc rod for high speed welding of sheet metal, Marquette offers the best for any shop. This range of rods includes high tensile, hard surfacing, cast iron, special alloys and bronze rods.

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1 The 90 Series Arc Welder
2 Jet Series Welding Torches

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WELDING EQUIPMENT

Marquette Manufacturing Company, Inc., 307 East Hennepin Avenue
Dept. 8-39, Minneapolis 14, Minnesota

PERSONAL NEWS

(Continued from page 10A)

school teacher. Professor Kiser became an assistant supervisor of vocational agricultural education in 1938. He was active in many local and state groups for the improvement of farming methods and rural electrification.

MR. RAMP AT SOUTHERN ILLINOIS UNIVERSITY

Wayne S. Ramp, formerly vocational machine shop instructor at Streator Township High School, Streator, Ill., has returned to this country after spending some time in Baghdad, Iraq, as a member of the Bradley University Team. In addition to his work as assistant director and metals specialist with the Bradley University Team, he was consultant of the Industrial Engineering Institute, at Baghdad.

Mr. Ramp is now on the industrial education staff at Southern Illinois University, Carbondale, Ill.

HOMER C. ROSE RECEIVES CITATION

Homer C. Rose, chief, proficiency development division, Civil Aeronautics Administration, Washington, D. C., has received the Epsilon Pi Tau Laureate Citation. Epsilon Pi Tau is the international honorary professional fraternity for industrial education.

The presentation was made through Stout State College, Menomonie, Wis., where he received his B.S. degree in 1931.

Dr. Rose accepted his present position in August, 1956. Prior to that for several years he was the Senior Training Specialist, Training Division, Bureau of Naval Personnel, U. S. Navy.

NEW HEAD OF BATTELLE MEMORIAL INSTITUTE

Dr. B. D. Thomas, scientist and research administrator, has been named to the presidency of Battelle Memorial Institute to succeed Dr. Clyde Williams, whose retirement as president was announced recently. Announcement of the new appointment was made by the Institute's Board of Trustees.

Active head of Battelle since being named director a year ago, Dr. Thomas has been a member of the Battelle organization for many years. He joined the staff as a research engineer in 1934, was appointed assistant director in 1942, and vice-president in July, 1955.

Dr. Thomas' varied scientific interests are reflected in his report on "The Technology of Iron Ore" for the President's Materials Policy Commission (1951), his published papers in physical chemistry, and his papers and patents on methods of separating, sorting, and concentrating of minerals. He has also written and lectured extensively on research management and the philosophy of science and research. Along with his scientific and technical activities, Dr. Thomas has carried important administrative responsibilities for most of his 23 years at Battelle.

He is a graduate of the University of Washington (B.S., 1929; Ph.D., 1933), where he was awarded a DuPont fellowship in chemistry. He is a member of Phi Lambda Upsilon and Sigma XI, honorary chemistry and scientific research societies, respectively. Earlier this year he was granted the honorary degree of doctor of engineering by the Michigan College of Mining and Technology "in recognition of high attainments in engineering."

(Continued on page 33A)

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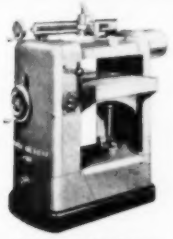
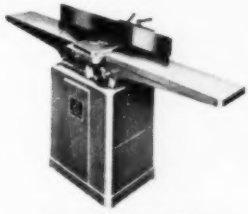
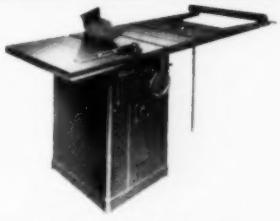


18" x 6" Surfacer
New low price!

Spindle Sander



New 6" - 8" Jointers
With exclusive
Shear-Cutting Fence

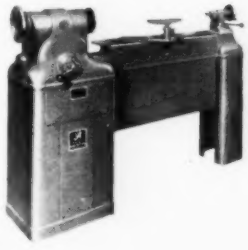


New! 10" Tilting-Arbor Circular Saw
Bigger-than-ever-Capacity

Mortiser

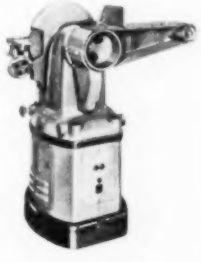
20" Band Saw

New! 14" Band Saw



New! 12" Lathe
Choice of gap or
solid bed at no extra cost

Shaper



16" Combination Belt and Disc Sander

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BELOIT, WISCONSIN

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Woodworking Equipment, Tools, and Supplies

These lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films, and silent, or sound movies, may be used by the students in the industrial arts and vocational education courses.

BENCH
1. Shop, with hardwood tops, 1¾ in. or over in thickness, the top to project far enough to allow a rapid-acting or continuous-screw vise to be attached.
   It may be well to order a 1-in. birch or maple board wide enough to cover the working face of the bench at the time of buying the benches. This board can then be fastened to the top proper with screws and may be conveniently replaced when worn. The benches should be made of thoroughly kiln-dried lumber throughout. They may be either plain or of 6-drawer type
2. Glue 3. Stain, with metal-covered top
4. Teacher's demonstration

BOOKCASE

BULLETIN BOARD

CABINETS — wood or metal for filing class records, instruction sheets, drawings, finishing materials, hardware, small tools, supplies, etc.

CHAIRS — teacher's and tablet arm

CHALKBOARD — permanent or portable

CORE OVEN — for patternmaking class

DESK — teacher's, with drawer compartments

DRILL — portable electric

FURNACE — for melting soft metals (for patternmaking class)

GLUEPOT — 1 qt. or 2 qt., electric, gas, or steam heat

GLUE WARMER OR COOKER — 1- to 5-gal. capacity

GRINDER
1. Automatic knife, direct-motortype. Size to suit largest knife used in school shop, complete with water pump, grinding wheel, and automatic stops
2. Bench, hand or power
3. Bench, motor-in-head. Motor bearings to be completely housed, wheels to be equipped with safety flanges and carefully guarded throughout. One fine-grit, and one coarse-grit wheel
4. Revolving oilstone, pedestal type, with one fine and one coarse oilstone

JOINTER
1. 6- or 8-in. portable jointer. Table to be fitted for rabbeting. Safety-cylinder type, equipped with safety guard
2. 12-, 16-, or 18-in. direct motor drive, ball bearing. Cylinder to be of safety-head type. Table to be fitted for rabbeting. Jointer to be equipped with safety guard.

LATHES
1. 6- to 16-in. motor-in-head, motor-in-base, or belt-driven speed lathe, to take 24, 36, 48, 60, or 72 in. between centers. Each to be complete with cup center, spur center, faceplate, rosette chuck, tool rests, and center drift for head block.
2. Patternmakers', with end faceplate provision. Lathe to be of direct-motor-drive type, equipped with variable speed motor, faceplates and floor stand. (For patternmaking class)

MORTISER
1. Direct-motor-drive, or belt-driven, hollow-chisel mortiser, foot feed. Table to be of the tilting type with hold-down clamps and stop rod.
2. Portable, vertical, hollow-chisel mortiser, bench type

PLANER — 12-, 18-, 20-, 24-, or 30-in., motor or belt driven, single-surface planer. Safety-head cylinder, three-knife type, fitted with good-grade steel knives. Knife-setting and jointing device complete with bar should be mounted on machine if possible.

SANDER
1. Belt, direct motor drive
2. Disk, motor or belt driven
3. Oscillating spindle, motor driven
4. Portable, hand-plane type, direct motor drive
5. Vertical spindle and disks sander

SAWS
1. Band saw, 20 to 36 in., motor drive. Upper and lower wheels to be completely guarded. Table to tilt to 45 deg.
2. Combination, band saw, crosscut saw, ripsaw, and mortiser. Machine to be completely guarded
3. Cutoff, pedestal or swing type to be fitted with 12- to 16-in. saw
4. Filing machine, direct motor drive
5. Jig, direct motor or belt driven
6. Portable band saw, 14 to 20 in. ball bearing, motor driven
7. Saw bench, directly connected to motor, and to have both rip and crosscut saws. Rip and crosscut gauges also to be provided
8. Universal saw bench, 14 to 16 in., motor driven
9. Variety saw bench, motor driven, tilting table, with universal sliding table. The arbor is to be fitted for a dado head, and the table is to be slotted accordingly. The saw is to be equipped with ripping fence and miter cutoff gauges

SHAPER
1. Motor drive, single or double spindle. Table to be equipped with removable center plate.
2. Portable shaper or router with a suitable selection of cutters

TENNONER — single end, with coping heads and cutoff saw

VISES — rapid-acting or solid-nut type woodworking-bench vises, 7 to 10 in.

WOOD TRIMMERS — complete with all gauges and taper pins. Base of trimmer to be slotted and laid out for degree settings (for patternmaking class).

Woodworking — Small Tools

AWLS — brad, assorted sizes

BEVELS
1. Protractor
2. Sliding T, 8 in.

BITS
1. Auger, 3/16 to 1 in., inclusive, by 16ths
2. Auger, 3/16 in. to ½ in. inclusive, by 16ths
3. Braces, ratchet type, 8-, 10-, 12-, or 14-in. sweep
4. Countersink, for wood, rose pattern, ½ in. and 5/8 in.
5. Dowel, square shank, ¼ in., 5/16 in., 3/8 in., ½ in., ¾ in.
6. Expansive, 7/8 in. to 1½ in.
7. Expansive, 7/8 in. to 3 in.
8. Forstner, square shank, ¼ in. to ½ in. inclusive, by 16ths
9. Screw driver square shank, ¼ in., 5/16 in., 3/8 in.
10. Twist drill for wood, square shank, 1/16 in. to 3/8 in. inclusive, by 16ths
11. Twist drill, straight shank, 1/16 to 3/8 in. inclusive, by 32nds

BLOWTORCH

BROOMS

BRUSHES
1. Bench duster, 10 in.
2. Floor
3. Glue, round, ½ and ¾ in.
4. Glue, round, 1½ in.
5. Marking, camel's hair, No. 1 and No. 2
6. Varnish, flowing, 2 and 2½ in.
7. Varnish, flat, ½, ¾, and 1 in.

BURNISHERS — oval or round

CAN OPENER

CARVING TOOLS
1. Sets containing 6 tools
2. Sets containing 12 tools

CHISELS
1. Cold, machinists', 3/8 and ½ in.
2. Mortising chisel and bits, ¼ to 5/8 in. by 16ths
3. Socket firmer, bevel edge, 1/8, ¼, ½, ¾, 1, and 1½ in.
4. Socket firmer, plain edge, ½, ¾, and 1 in.
5. Tanged firmer, bevel edge, 1/8, ¼, ½, ¾, 1, and 1¼ in.

CLAMPS
1. Bar, 24, 36, 48, and 60 in.
2. Hand-screw, 4, 5, 6, 7, 8, 10, 12, and 14 in.

DIVIDERS — wing, 6 in. and 10 in.

DOWEL PLATE — 6 in. long

DOWELING JIGS — with bushings

DRAWKNIVES — 7 in.

DRILL
1. Automatic hand, with 8 drill points
2. Chuck, 0 to 3/8 in.
3. Hand, 0 to 3/8 in., for roundshank drills
4. Star, for concrete, ½ and ¾ in.

FILES
1. Auger bit, assorted, 6 in.
2. Cabinet, 8 and 10 in.
3. Card and brush
4. Flat, wood, 10 in.
5. Mill, bastard cut, 12 in.
6. Round, bastard cut, 12 in.
7. Taper, slim, 5½ and 7 in.

FIRST-AID CABINET AND SUPPLIES

GAUGES
1. Bit, adjustable
2. Jointer
3. Marking, metal or hardwood
4. Mortise, metal or hardwood
5. Panel

GLASS CUTTER

GOUGES
1. Tanged firmer, outside ground, handled, 1/8, ¼, ½, ¾, and 1 in.
2. Tanged firmer, inside ground, handled, 1/8, ¼, ½, ¾, and 1 in.
3. Spoon, ½, ¾, and 1 in.

HAMMERS — claw, bell faced, 10-, 12-, 13-, and 16-oz.

HATCHET — bench, 4-in. cut

JARS — earthenware, 1 qt. capacity

KNIVES
1. Jointer, to fit power machine
2. Planer, to fit power machine
3. Sloyd, 3-in. blade

LEVELS
1. Wood, 24 in.
2. Machinists', 12 in.

MALLETS — hickory, 3 by 5 in. head

NAIL SETS — 1/16 and 3/32 in. points

OILERS — bench, ½ pt., coppered, best grade

OILSTONES
1. 1 by 2 by 8 in. in iron box

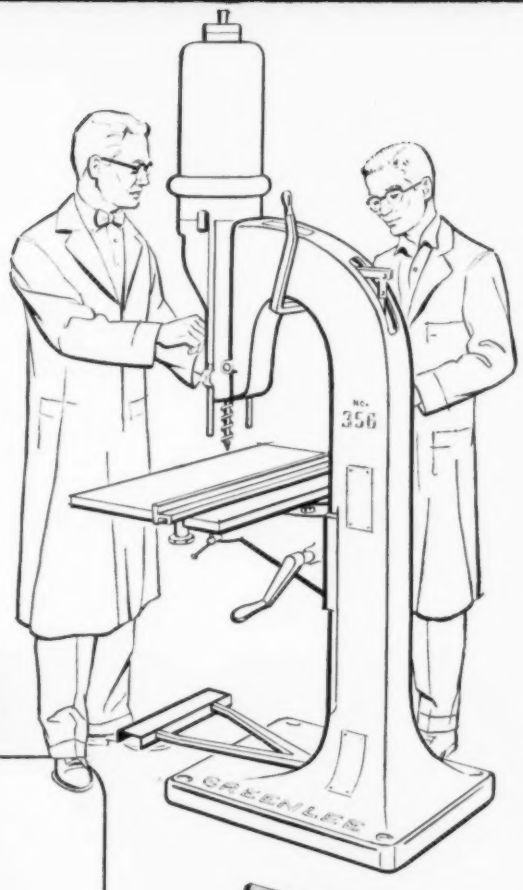
(Continued on page 30A)

TOOLS FOR CRAFTSMEN
GREENLEE

Precision Tools Aid Craftsmanship

GREENLEE TOOLS stay sharp . . . help students produce better wood products!

Enjoy the pride of craftsmanship your students obtain from industry-proven Greenlee tools for boring, routing and mortising. Reduce department costs with fewer tool replacements. Realize the peace of mind that comes from a safer school shop using sharp, safe Greenlee tools. Greenlee production quality tools are made of tough alloy steels that hold a safer, cleaner cutting edge . . . bring out the best possible performance from your machines. They are correctly designed for extra quality, superior workmanship. See your Greenlee jobber or write today.



101-B REGULAR HOLLOW CHISEL AND BIT
143 SINGLE FLUTE ROUTER
150 DOUBLE SPUR MACHINE BIT
149 MULTI-SPUR MACHINE BIT

WRITE FOR CATALOG 34-M

You'll find it contains valuable information about all Greenlee tools, and a wood screw boring chart that tells what drill bits to use for drilling wood screw holes of various sizes.

WOODWORKING MACHINERY MANUFACTURERS' ASSOCIATION WMMA

GREENLEE TOOL CO.

Division of Greenlee Bros. & Co.
2463 HERBERT AVENUE
ROCKFORD, ILLINOIS

(Continued from page 28A)

2. Gouge slip, medium, 4½ by 2⅛ by ⅝ by 5/16 in.
3. Gouge slip, fine, 3 by 2 by ⅜ by ⅛ in.

PINCERS — 6 in. carpenters'
PINCH DOGS — ¾, 1, and 1¼ in.
PLANES
1. Block, adjustable, 6 in. long, 1⅝-in. cutter
2. Circular
3. Combination, adjustable
4. Core box
5. Duplex, fillister and rabbet
6. Fore, ⅛ in., 2⅜-in. cutter
7. Irons, double
8. Jack, 14 in., 2-in. cutter
9. Jointer, 24 in.
10. Round, wood, 1¾ in.
11. Router
12. Smooth, 9 in., 1¾- or 2-in. cutter

PLIERS
1. Roundnose, 5 in.
2. Side-cutting, 6 in.

PUTTY KNIVES
RASPS — half round, wood, 10 in.
RULES
1. Board
2. 1 or 2 ft. graduated by 8ths and 16ths
3. Shrink, ⅛ and 3/16 in.

SAWS
1. Back, 12 in., 14 point
2. Band, to fit power machine
3. Compass, 10 in.
4. Coping, frames
5. Coping, blades
6. Crosscut, 9 tooth, 22 in. long
7. Crosscut, circular for power machine
8. Dado, ⅛ to 1 1/16 in. to fit power-saw arbor
9. Hack, frames, 10 in. or adjustable
10. Hack, blades, 10 in.
11. Keyhole, 10 in., 10 point
12. Rip, 7 point, 22 in. long
13. Rip, circular for power machine
14. Set, 10 points per inch and finer
15. Set, 10 points per inch and coarser
16. Turning frame, 14 in.
17. Turning blades, 3/16 by 12 in., 10 tooth
18. Miter box, 24 by 4 in. saw, 7 in. capacity at miter

SCRAPERS
1. Cabinet
2. Glue, triangular
3. Veneer, blade, 2¾ in. long, handle 11 in. long

SCREW DRIVERS
1. Cabinetmakers', 4, 6 and 8 in.
2. Quick return, spiral ratchet

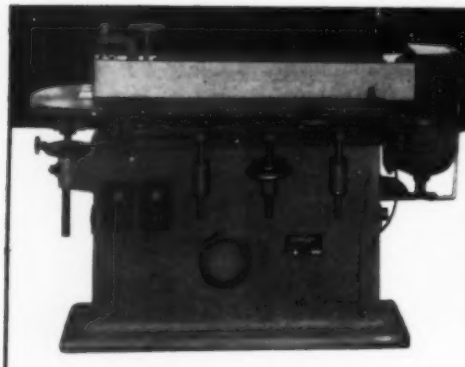
SHOOT BOARD — and plane
SNIPS — tinners', forged steel, 2½-in. cut
SPOKESHAVES — adjustable, raised handle, 10 in. long
SQUARES
1. Combination, 12 in.
2. Try, iron handle, 8 in.
3. Framing, 2 ft.

STEEL FIGURES — hand cut, ⅜ in.
TAPELINE — 50 ft., steel
TRAMMEL POINTS — adjustable metal frame, steel points
TURNING TOOLS
1. Calipers, 6 in. inside and outside
2. Calipers, 12 in. inside and outside
3. Parting tools, ⅜ in.
4. Round point, ¼, ½, and ¾ in.
5. Spear point, ¼, ½, and ¾ in.
6. Square point, ¼, ½, and ¾ in.
7. Turning chisels, ¼, ½, and ¾ in.
8. Turning gouges, ¼, ½, and ¾ in.
9. Turning skews, L.H., ¼, ½, and ¾ in.
10. Turning skews, R.H., ¼, and ½ in.

VISE — 3-in. jaw, anvil face
WRENCHES
1. Adjustable, 8, 10, and 12 in.
2. Headless setscrew
3. Pipe, 10 and 12 in.
4. S type or open-end type to fit ⅛ in. to 1-in. N.C. nuts

OAKLEY BUILDS PERFORMANCE, SAFETY, SPEED INTO FINE SANDER-POLISHERS

...FOR EXAMPLE



OAKLEY H-6 EDGE SANDERS

So... you're working limited size stock . . . and you don't think you need to buy a heavy-duty sander. You're right! Because the Oakley H-6 Edge Sander is a light-duty unit requiring minimum floor space combining heavy-duty performance and keen precision.

- BALL-BEARING OSCILLATION
- TABLES TILT QUICKLY
- PRECISION BUILT

.....

WRITE FOR FREE INFORMATION TODAY

Dept. 13

OSCILLATING OR NON-OSCILLATING

Model H-6 is the oscillating sander with Models H-6A the non-oscillating unit. Both are very reasonably priced.

The Oakley Co. SINCE 1934

BRISTOL TENNESSEE

Woodworking — Materials and Supplies

ALCOHOL
BENZINE
BRADS — ⅜, ½, and 5/8 in. No. 20; ¾ and ⅞ in. No. 19; 1 in. No. 18; 1¼ and 1½ in. No. 16; 1¾ in. No. 15; 2 in. and 2½ in. No. 14
CARBON PAPER — black
COLORS — dry: burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, Vandyke brown, and vermillion
COLORS — ground, in oil or japan; burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, rose lake, Vandyke brown, and vermillion
DECALCOMANIA TRANSFERS
DOWEL PINS AND PLATES
DOWELS — hardwood, 3-ft. lengths, ¼, 5/16, ⅜, ½, and ¾ in.
ENAMEL
1. Selected colors
2. Undercoater

FILLERS — paste: natural golden oak, dark oak, and mahogany
FILLETS — leather, ¼ and ½ in.
GLUE
1. Casein, hide, best grade cabinet
2. Liquid

HARDWARE — brackets, buttons, butts, casters, catches, chain, chest corners, chest trimmings, corner braces, corner irons,

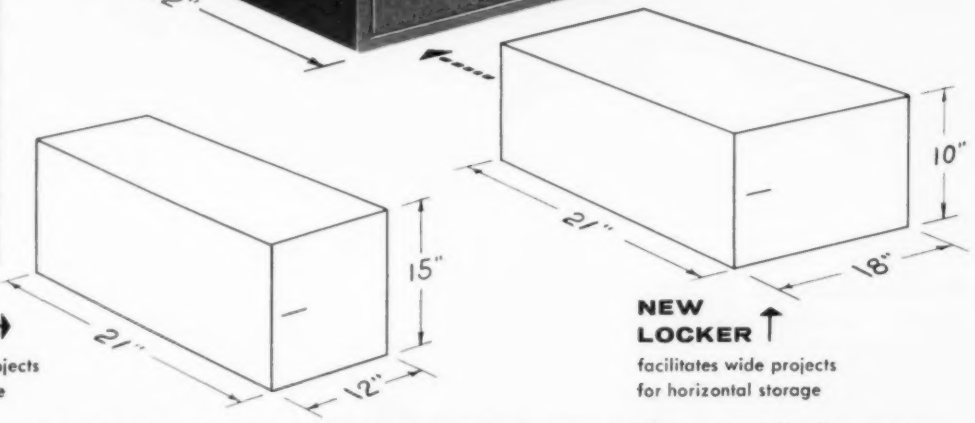
(Continued on page 32A)

ANOTHER FIRST

L-4A Recommended for all school shops 1958

BRODHEAD-GARRETT

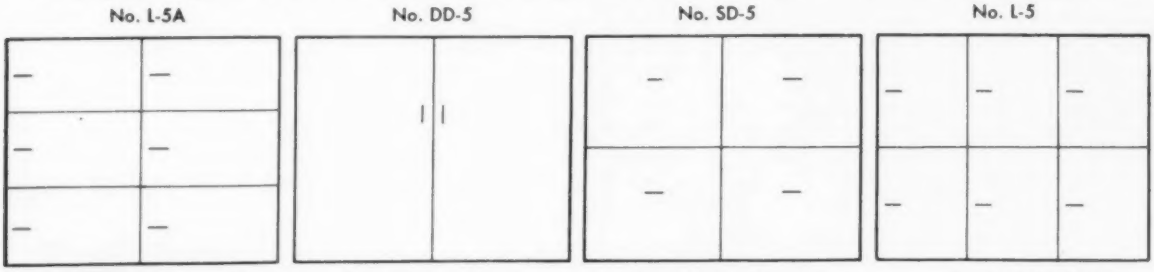
Model No. L-4A contains 50% more horizontal shelf space



PRESENT LOCKER →
facilitates high projects for vertical storage

NEW LOCKER ↑
facilitates wide projects for horizontal storage

NOW – you have your choice of 4 metal bench bases



No. L-5A — Six wide lockers

No. DD-5 — Two double doors

No. SD-5 — Four sliding drawers

No. L-5 — Six high lockers

NOW — you have your choice of 3 school shop colors

OLIVE GREEN

STANDARD GRAY

VISTA (LIGHT) GREEN

BRODHEAD-GARRETT CO. 4560 East 71St., Cleveland 5, Ohio
Industrial Education • Benches • Machinery • Tools • Hardwood Lumber

Elmer says:

ELMER'S® GLUE-ALL IS YOUR BEST SCHOOL BUY!

You'll find Elmer's modern plastic glue perfect for your classes. It will bond any porous material such as wood, paper, cloth or pottery. It's easy to apply, fast drying and extra strong. What's more, Elmer's handy plastic squeeze bottles are *easily refilled* and come in sizes 1¼ ozs. to 16 ozs.... to fit any hand from kindergarten to shop senior. Order your Elmer's Glue-All from your favorite supplier today. Also available in pint, quart, gallon and 5 gallon sizes for shop use, or for refilling small plastic squeeze bottles.

There's a BORDEN Glue for every job!

ELMER'S® Waterproof Glue

For completely waterproof bonds . . . can be applied to any wood joint subject to water, weather, acids or alkalis. Super bond is stronger than wood itself. It's the glue boating experts use!

ELMER'S® Contact Cement

To bond plastic laminates or vertical plywood wall panels ... no clamps, nails or presses needed. Highly resistant to heat and water. Available in regular or non-flammable type to meet every need.

look for this emblem and remember . . .

if it's Borden's *it's got to be good!*

(Continued from page 30A)

corner plates, desk fittings, door fittings, escutcheons, fasteners, handles, hangers, hinges, hasps, holders, hooks, knobs, latches, lamp fittings, lid supports, locks, pulls, smoking-stand outfits, springs, stops, supports

HOOKS
1. And eyes
2. Cup
3. Screw
4. Square screws

LACQUER — black, clear, cobalt blue, ivory, medium green, red, thinner, white, and yellow

LUMBER — ash, balsa, bass, birch, cherry, cypress, locust, mahogany, maple, oak, poplar, red cedar, red gum, redwood, sap gum, yellow pine, walnut, white pine
In ordering pine, mill run, kiln dried will be found suitable for carpentry, while short, select, kiln dried, 4 in. and wider or No. 1 shop common, kiln dried will be required for cabinetmaking and patternmaking
Hardwood for furniture should be specified first and second grade, kiln dried, standard widths and lengths, or short lengths

MOLDINGS

NAILS
1. Common, 6d, 8d, and 10d
2. Flathead, ½ in. No. 20, ¾ in. No. 19, 1 in. No. 18, 1¼ in. and 1½ in. No. 16, and 2 in. No. 14
3. Finishing, 4d, 6d, and 8d

OIL
1. Linseed, boiled
2. Linseed, raw
3. Machine
4. Rubbing

OVERLAY CARVINGS

PANEL OR PLYWOOD — 3 ply, 5 ply, and 7 ply

PATTERN LETTERS

PINS — escutcheon

PUMICE STONE — No. 0

RAPPING PLATES

ROTTENSTONE

SANDPAPER — Garnet cabinet paper, 3/0, 2/0, 0, ½, 1
Garnet finishing paper, 6/0, 4/0
Garnet paper can also be obtained in rolls of 50 yd. in widths 4 in. up to 48 in. Narrower widths on special order

SCREW EYES

SCREWS
1. Flathead, brass, No. 3 by ⅜ in., No. 4 by ½ in., No. 5 by ⅝, and ¾ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1 in., No. 10 by 1¼, 1½ and 2 in., No. 12 by 1¼, 1½, and 1¾ in.
2. Flathead, bright, No. 3 by ½ in., No. 4 by ½ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1, and 1¼ in., No. 10 by 1¼, 1½, and 1¾ in., No. 12 by 1½, 1¾, and 2 in., No. 14 by 2¼ and 2½ in.
3. Oval head, brass, No. 5 by ¾ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1 in., and No. 10 by 1¼ in.
4. Roundhead, blued, No. 3 by ⅜ and ½ in., No. 5 by ¾ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1 in., No. 10 by 1¼, and 1½ in., No. 12 by 1½ in.
5. Roundhead, brass, No. 3 by ⅜ in., No. 4 by ½, and ⅝ in., No. 5 by ¾ in.

SHELLAC
1. Orange, cut 4 lb. to the gal.
2. Sticks, assorted colors
3. White, cut 4 lb. to the gal.

NOTE: Shellac should be kept in glass or earthenware containers

STAINS — oil, spirit, or water. Fumed oak, dark oak, golden oak, light oak, mahogany, and walnut

STEEL WOOL — No. 0 and No. 2/0

TURPENTINE

TWINE

VARNISH — coach, flat, remover, spar, and rubbing

WASTE — cotton, white

WAX — bees and finishing

WHITE LEAD

Teaching is Easier—

with LOW COST—HIGH QUALITY—

SIMONDS SI-CLONE SAWS

...now Chrome Plated!

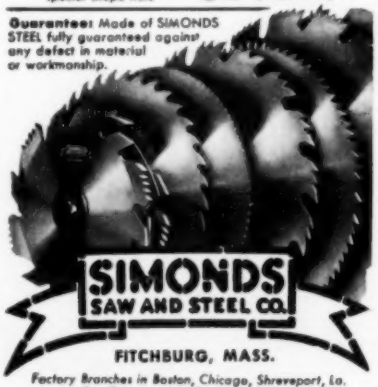
Your students will learn faster — and turn out better work too — with quality equipment that costs no more . . . that fits into shop allowances and actually costs less to maintain.

NOW CHROME PLATED, Simonds SI-CLONE Saws offer the most value for the least cost. Made to Simonds rigid, high quality standards, from electric furnace steel, these saws are given a hard, rust-resistant chromium finish. Chrome plating increases edge holding qualities and prevents rusting and accumulation of pitch on sides of the saw. Nine types — rip, cross-cut, combination and dado — are available in standard stock sizes to fit all popular makes of machines. Designed to cut fast, straight and smooth, stay sharp and last longer, these popular price saws come individually packaged, ready to use.

RIP, CUT-OFF AND COMBINATION SAWS			
6"	$2.75	9"	$4.10
7"	3.10	10"	4.60
8"	3.50	12"	6.60

Supplied with round or special shape hole

Guarantee: Made of SIMONDS STEEL *fully guaranteed against any defect in material or workmanship.*



FITCHBURG, MASS.

Factory Branches in Boston, Chicago, Shreveport, La. San Francisco and Portland, Oregon
Canadian Factory in Montreal, Que.

PERSONAL NEWS

(Continued from page 26A)

His professional affiliations include the American Chemical Society, the American Institute of Mining, Metallurgical and Petroleum Engineers, Gesellschaft Deutschen Chemiker (Germany), Societe de Chemie Industrielle (France), Society of the Chemical Industry (British), American Foundrymen's Society, Ohio Society of Professional Engineers, and the Chemist's Club (N.Y.C.).

NEW STAFF MEMBERS ADDED

The Ohio State University, Columbus, Ohio, has added four new staff members to the industrial arts teacher education program.

Dr. Willis E. Ray, former industrial arts teacher and assistant principal of the University High School at the University of Illinois, has joined the staff as an assistant professor. Dr. Ray received his Ed.D. in the summer of 1957 under the direction of M. Ray Karnes. Dr. Ray's dissertation involved an experimental study of teaching methodology in industrial education.

Thomas Eachus, formerly employed in the training division of North American Aviation, will head up the electricity and metal laboratories. He is pursuing a Ph.D. program.

Robert Fritz, formerly a teacher of industrial arts in the secondary schools of San Rafael, Calif., will head up the automotives' and crafts laboratories. He is studying for the Ph.D. degree.

John R. McElheny, chairman of the Department of Industrial Arts at the University of Miami, has joined the staff temporarily to pursue the Ph.D. degree. He is working with the elementary and occupational therapy students.

Donald W. Thiel, formerly an instructor in the program, recently matriculated and has joined the staff at San Diego State Teachers College. He has selected *Occupational Therapy and Industrial Arts* as his dissertation topic.

News Notes

HILL FELLOWSHIP ESTABLISHED AT OHIO STATE UNIVERSITY

A gift of $18,000 for the establishment of the Fred B., and Mabel Dean Hill Fellowship in Consumer Credit at Ohio State University, was accepted recently by the university's Board of Trustees. Income from the gift will be used for fellowships to encourage graduate study and research in the field of consumer credit. It was given through the Ohio State University Development Fund.

Ohio State is a pioneer in the development of a teaching program in consumer credit, with such courses offered in the commerce college as early as 1922, and Dr. T. N. Beckman of the department of business organization writing the first text dealing with consumer credit to any substantial degree. The first National Consumer Credit Conference was originated at the university in 1948.

University officials said the new Hill Fellowship would aid in helping Ohio State maintain its leadership in the field.

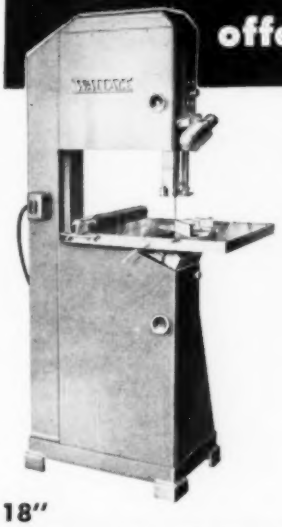
Mr. Hill is vice-president and a director of Capital Finance Corporation.

CHICAGO PUBLIC SCHOOLS ORGANIZATION

The Division of Industrial Arts and the Bureau of Technical Subjects have been combined into the Bureau of Industrial Arts and Technical Subjects, which supervises all shop and drafting instruction in elementary and

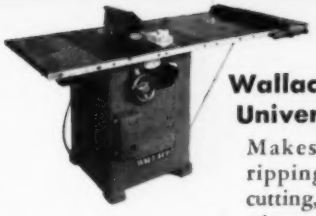
(Continued on page 36A)

Here are 5 good reasons why WALLACE Woodworking Machines offer *MORE for LESS!*



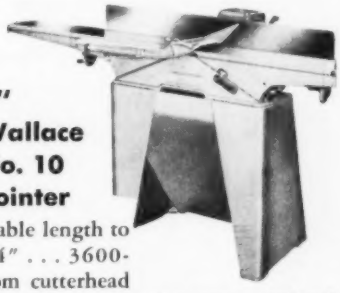
18" Wallace No. 56 Band Saw

Cuts woods, plastics, metals—easily and quickly! Features 50 to 3800-fpm speeds . . . and exclusive blade guide adjustment from above. Takes standard rip fence and miter gauge—adjustable from −10° to 45°. All this in a heavy-duty, quality band saw—maximum safety at lowest price.



Wallace No. 11 Universal Saw

Makes any cut, ripping or cross cutting, on 4′ x 8′ plywood panel without special jigs or fixtures. Has ample table area in all directions . . . 24″, 36″ or 48″ rip capacity . . . built-in drive unit. Cuts to 4″ depth. Moderately priced—outstanding in speed and capacity!

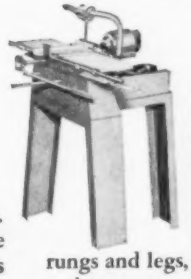


8" Wallace No. 10 Jointer

Table length to 64″ . . . 3600-rpm cutterhead direct drive—or 5200-rpm cutterhead speed gear drive . . . four 8″ skew-set knives for smoothest shear cut. Roller bearings resist shock, eliminate cutterhead chatter.

Wallace No. 55 Production Shaper

Brings fast, flexible operation to all shaper jobs. Features 10,000 or 7200-rpm spindle speeds. Produces extra fine finish. Has ample table surface, positive non-slip drive and optional spindles—1-piece or removable. Makes *any* cut with *any* cutter—and does it better!



Wallace Routiser

For joining cabinet and sash frames, rails and stiles, picture frame joints, chair rungs and legs, furniture frame parts and many, many other jobs. Can be arranged for mortise, tenon and boring work. A machine that's quick and easy to set up.

WRITE: J. D. WALLACE & CO., INC., WARSAW, IND.
UNION-WALLACE-INDIANA . . . A MANUFACTURING GROUP DEVOTED TO PRODUCING THE HIGHEST QUALITY WOODWORKING MACHINES.

J. D. WALLACE & COMPANY, INC. WARSAW INDIANA SINCE 1915

J. D. WALLACE & COMPANY, INC.

1055 N. Detroit St., Warsaw, Indiana

Automotive Equipment, Tools, and Supplies

This list of automotive equipment tools and supplies was prepared by the Automotive Industry — Vocational Education Conference on public school automotive instruction. It is reproduced here by permission for which A. D. Althouse, Detroit Board of Education and co-chairman of the conference, deserves special credit.

Because yearly changes in car and truck design often necessitate new service procedures, and consequently new types of tools, shop equipment must be replaced when it becomes obsolete as well as when it wears out.

The Automotive Industry — Vocational Education Conference therefore suggests the following amortization policy: hand tools, 2 years; special tools and testing devices, 5 years; and automotive parts, 3 years.

Supplies and Equipment

AIR HOSE
25′ length, ¼″ I.D., 5 ply red, complete with ¼″ pipe fittings

BATTERY BOLTS
⅜″ x 1½″ U.S.S. lead coated battery terminal bolts complete with nuts

BATTERY CLIPS
1. "B" battery clips cadmium plated
2. 50 ampere battery charging and test clips, lead coated

BATTERY COMPOUND — battery sealing compound

BINDING POSTS — screw type

BLADES
1. Hand hack saw, 24 teeth per inch
2. 10″, 32 teeth per inch hand hack saw

BRUSHES
1. 1½″ flat
2. 14″ x 1⅛″ steel wire, curved handle
3. 6″ diam. steel, wheel
4. 8″ bench or counter

BULBS
1. Auto lamp bulbs, 6 and 12 volt
2. Lamp auto, sealed beam No. 50–40 watts, double filament, three contact, 6 and 12 volt
3. Battery charger bulb (specify ampere capacity)

CABLE
1. Extension cable, double conductor, molded rubber covered, 18 ga. heavy duty
2. Primary, single conductor, stranded copper braid and lacquer covered, 14 gauge
3. Secondary, 7 millimeter, rubber, braid lacquered brown
4. Starter cable, No. 1 gauge rubber and woven cover insulation.
5. Starter cable, No. 6 gauge rubber and woven cover insulation

CABLE TERMINALS
1. Battery cable ground lugs for No. 1 starter cable
2. Battery cable ground lugs for No. 6 starter cable
3. Battery cable terminals, universal type or equal
4. Clip type, high tension terminal for 7mm. cable
5. Terminals, as-sos-11 solderless
6. Terminals, 3/16″ hole primary
7. Terminals, 3/16″ spade type primary

CHECKS, TOOL — brass, 1″ round

CLEANING COMPOUND
Oakite, Stoddart solvent or other material depending on the type of cleaning tank used.

CLIPS — crocodile

COTTER PINS
1. 3/16″ x ¾″, box of 1000
2. 3/32″ x 1″, box of 1000
3. ⅛″ x 1½″, box of 1000

DRILLS
1. H.S.S., ⅛″, jobbers, straight shank
2. H.S.S., 3/16″, jobbers, straight shank
3. H.S.S., 13/64″, jobbers, straight shank
4. H.S.S., 7/32″, jobbers, straight shank
5. H.S.S., ¼″, jobbers, straight shaenk
6. H.S.S., 17/64″, jobbers, straight shank
7. H.S.S., 9/16″, jobbers, straight shank
8. H.S.S., 21/64″, jobbers, straight shank
9. H.S.S., 23/64″, jobbers, straight shank
10. H.S.S., ⅜″, jobbers, straight shank
11. H.S.S., 25/64″, jobbers, straight shank
12. H.S.S., 27/64″, jobbers, straight shank
13. H.S.S., 7/16″, jobbers, straight shank
14. H.S.S., 29/64″, jobbers, straight shank
15. H.S.S., ½″, jobbers, straight shank

DRY CELL
No. 6 dry cells, with screw connections

EMERY CLOTH — No. 2/0, 9″ x 11″

FILE
1. 10″ flat bastard (24 minimum)
2. 10″ half round bastard (6 minimum)
3. 10″ half round lead float (4 minimum)
4. 10″ hand smooth (12 minimum)
5. File handle, large, medium, small (specify size), (24 minimum)
6. 10″ mill smooth (12 minimum)
7. 10″ round bastard (6 minimum)
8. Ignition point file (10 minimum)
9. Regulator point file, Delco-Remy model W-19
10. 6″ saw file, extra slim taper (4 minimum)
11. Warding, 6″ smooth (4 minimum)

FUSES — automobile Nd. 3 ag, 20 amp.

GASOLINE — commercial grade (as needed)

GAUGE (thickness gauge)
1. .002″ thickness, ½″ width, ground thickness gauge stock
2. .003″ thickness, ½″ width, ground thickness gauge stock
3. .005″ thickness, ½″ width, ground thickness gauge stock
4. .010″ thickness, ½″ width, ground thickness gauge stock
5. .015″ thickness, ½″ width, ground thickness gauge stock

GREASE
Chassis, purchase in quantity depending on amount used

GRINDING COMPOUND
2 compartment oil mixed grades A & E

GRINDING WHEELS
When requesting grinding wheels for replacement purposes, be sure to specify the material bond, grain, size, and hardness or grade

HANDLE, HAMMER
1. 14″ length, 16 oz. machinist's
2. 18″ length, 24 oz. machinist's

HOSE
1. ¾″, rubber, 2 ply, 50′ lengths
2. Radiator hoses are molded for specific cars

HOSE CLAMPS
Universal type, to fit 1″ to 3″ O.D. hose

HYDRAULIC BRAKE FLUID

HYDROMETER FLOATS
1. Automobile storage battery, hydrometer float only
2. Automobile radiator hydrometer float only, calibrated for alcohol, glycerine, and prestone

INSULATOR
1. Rubber to fit mueller No. 85 clips, red mueller No. 87
2. Rubber to fit mueller No. 85 clips, black mueller No. 87

NUTS, MACHINE SCREW
1. No. 6–32, hex, steel
2. No. 8–32, hex, steel
3. No. 10–24, hex, steel

NUTS
1. ¼″–20 hex, semifinished
2. 5/16″–18 hex, semifinished
3. ⅜″–16 hex, semifinished
4. 7/16″–14 hex, semifinished
5. ½″–13 hex, semifinished
6. ¼″–28 hex, semifinished
7. 5/16″–24 hex, semifinished
8. ⅜″–24 hex, semifinished
9. 7/16″–20 hex, semifinished
10. ½″–20 hex, semifinished

NUTS
1. ¼″–28 castellated hex, semifinished
2. 5/16″–24 castellated hex, semifinished
3. ⅜″–24 castellated hex, semifinished
4. 7/16″–20 castellated hex, semifinished
5. ½″– castellated hex, semifinished
6. ¼″–20 castellated hex, semifinished
7. 5/16″–18 castellated hex, semifinished
8. ⅜″–16 castellated hex, semifinished
9. 7/16″–14 castellated hex, semifinished
10. ½″–13 castellated hex, semifinished

OIL — S.A.E. No. 30, engine oil (as needed)

PAINT (for shop maintenance)
1. Black, quick drying enamel
2. Red, quick drying enamel
3. White, quick drying enamel
4. Machine enamel, gray

PANS
Automobile drain pans, approximately 3 gallon capacity, height not to exceed 5″, galvanized

PLUGS
1. Attachment, molded soft rubber two prong, body only
2. Attachment cap only
3. Three prong for grounding

RAGS
Wiping, bleached and washed. (Some schools may prefer to use wiping rags supplied and washed by a local laundry service)

SAFETY WASHERS (grinding wheel)
Order by pair, specify arbor size and diameter flange for grinding wheels

SALAMMONIAC — for cleaning soldering coppers

SANDPAPER
1″ width, No. 00, 50 yd. roll for commutators

SCREWS, MACHINE
No. 6–32 x 1″, round head
No. 8–32 x 1½″, round head
No. 10–24 x 2″, round head

SCREWS, CAP
¼″–20 x 1¼″, hex.
5/16″–18 x 1½″, hex.
⅜″–16 x 1¼″, hex.
½″–13 x 2″, hex.
¼″–28 x ¾″, hex.
5/16″–24 x 1¼″, hex.
⅜″–24 x 1½″, hex.
7/16″–20 x 1¼″, hex.
½″–20 x 2″, hex.

SHELLAC — white, 4 pound cut

SOCKETS, LIGHT
1. Dash light, double contact, 6 volt
2. Dash light, single contact, 6 volt

SOLDER, PASTE — all purpose, noncorrosive

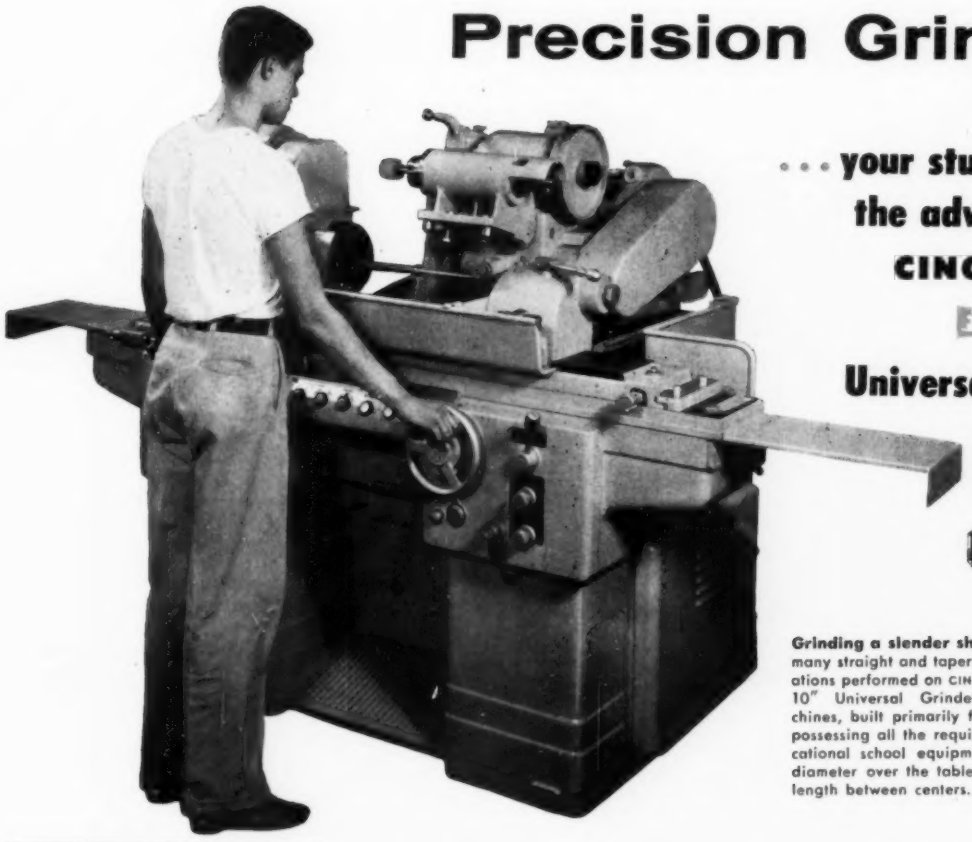
SOLDER WIRE
No. 5 spools, ⅛″ diameter, 50–50 alloy

SPARK PLUGS
1. 14 millimeter metric
2. 18 millimeter metric

STAPLES — insulated, ½″

(Continued on page 42A)

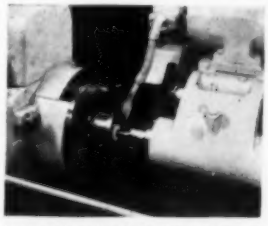
To be well informed in Precision Grinding



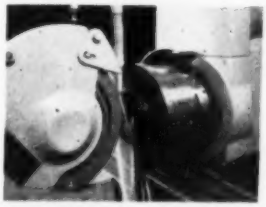
Grinding a slender shaft, one of the many straight and taper grinding operations performed on CINCINNATI FILMATIC 10" Universal Grinders. These machines, built primarily for industry but possessing all the requirements for vocational school equipment, swing 10" diameter over the table, and take 24" length between centers.

. . . your students need the advantage of CINCINNATI FILMATIC Universal Grinders

CINCINNATI



Internal grinding. The internal grinding head is permanently hinge mounted; does not interfere with other setups.



Face grinding. For this type of setup the headstock is swiveled 90°. The chuck is standard equipment.

Every school shop needs versatile equipment. And for instructions in precision grinding, no other machine equals the versatility of CINCINNATI® FILMATIC Universal Grinders. Here are some of the setups your students can perform:

External cylindrical grinding, straight and taper
Internal grinding, straight and taper
Face grinding
Shoulder grinding (with "double shaft" motor)

In addition to the advantage of versatility (a basic requirement for instructions in modern grinding techniques) CINCINNATI FILMATIC Universal Grinders are exceptionally durable. For example: grinding wheel spindle bearings are Cincinnati's exclusive FILMATIC type, never require adjustment, never wear out . . . lubrication is principally automatic, with filtered oil . . . castings are made in Cincinnati's own foundry from selected grades of iron. Would you like to know more about these fine machines? You will probably be most interested in the 10" size. Write for your copy of catalog No. G-577-6.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

CENTERTYPE GRINDING MACHINES • MICRO-CENTRIC GRINDING MACHINES
CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES • CHUCKING GRINDERS • CENTERLESS LAPPING MACHINES

CINCINNATI

FERROX

Prevents Slipping and Falling

EASY TO APPLY

LOW COST • LONG LASTING

Millions of tiny, sharp, abrasive particles in Ferrox provide safe footing even when covered by grease, oil, water, or metal or wood chips—falls and accidents are prevented.

Not only ideal for shops, but used in shower stalls, dressing room areas, and around swimming pools.

Ferrox can be easily troweled into place. It permanently adheres to wood, metal and concrete and is unharmed by oils and chemicals. Just a thin coating is necessary for long, trouble-free life. Approximately 1/16" thick, and therefore does not cause trip hazard as you approach safety covering.

Ferrox can be quickly applied without disrupting schedules or classes. The cost is low—one gallon covers approximately 35 sq. ft.

The Navy uses thousands of gallons to prevent slipping on their ships.

Available in four colors—black, red, grey or green. Write today for Ferrox bulletin.

AMERICAN ABRASIVE METALS COMPANY

466 COIT ST., IRVINGTON 11, N. J. AD 197

NEWS NOTES

(Continued from page 33A)

high schools. Eight hundred shop and drafting teachers and 106,000 elementary and high school students are included in the Chicago Industrial Education program.

The supervisory personnel of the new Bureau of Industrial Arts and Technical Subjects which supervises Industrial Arts and Trade and Industrial Education is as follows:

Dr. Louis V. Newkirk

Dr. Louis V. Newkirk, director, Bureau of Industrial Arts and Technical Subjects; Eskel L. Erickson, graphic arts; Henry F. Gilson, assistant director, special services; Wesley D. Golden, woodworking, plastics; Raymond B. Grashoff, area industrial arts supervisor; Robert E. Jelinek, assistant director, veterans training, electricity; George J. Jennings, area industrial arts supervisor; Willey P. Klingensmith, area industrial arts supervisor; Warren A. Koerner, drafting; Arthur J. LaPointe, auto mechanics, aviation; John T. Newell, area industrial arts supervisor; Andrew J. Scholar, metalworking.

The new Bureau of Industrial Arts and Technical Subjects, Bureau of Commercial Education and Bureau of Home Economics are in the Department of Vocational and Practical Arts Education under the supervision of Dr. Hobart H. Sommers, assistant superintendent.

The Department of Vocational and Practical Arts Education has been transferred to the Department of Instruction which is under the supervision of Dr. Thaddeus J. Lubera and Dr. James H. Smith, associate superintendents.

THE AMERICAN INSTITUTE OF PHYSICS

A group of leading scientists gathered in New York on Monday, October 21, 1957, to dedicate the new building of the American Institute of Physics. The building, at 335 East 45th St., near the United Nations, is headquarters for America's 20,000 physicists.

The American Institute of Physics, a federation of five professional societies, publishes all of the principal American technical journals of physics. It also conducts various other programs designed to advance the science of physics and to improve the quality and quantity of future physicists in America.

College presidents, Nobel Prize Winners in Physics, officers of scientific societies and individuals prominent in physics research and education participated in the dedication ceremonies.

(Continued on page 40A)

IRWIN Wood-Boring Tools

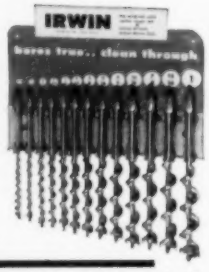
help get school shop projects done on time

The faster, cleaner, always accurate boring action of Irwin wood boring tools saves time and materials, steps up class room efficiency. Projects get done on time. The quality of the finished job stimulates student interest and appreciation of good workmanship. And replacement costs are lower, too. Irwin wood-boring tools are made to last much longer. Put Irwin to work in your shop and see. Order from your school shop jobber or independent hardware dealer.

IRWIN SPEEDBOR "88"
New spade type electric drill. Does more work with less power — steps up the efficiency of small ¼" electric drills and drill presses. Exclusive hollow ground point bores cleaner, faster in hard and soft woods, plywood, plaster, plastics. No wobble or run off. Size markings on head. Hang-A-Bit hole for storing on nail or pin. Sizes ¼" to 1", open stock or sets.

62T BORCHEST SET
America's most popular School Shop set. 13 Irwin 62T hand brace type bits in hand-rubbed hardwood box, sizes ¼" to 1". Medium fast screw pitch makes the Irwin 62T ideal for all-purpose boring in most any wood. Double cutter action, solid center design, hardened full length for longer life. Each bit highly polished. Also available in individual sizes and plastic roll sets.

D-13 SCHOOL SHOP SPECIAL
Irwin storage rack and bit set. A convenient combination of 13 Irwin 62T wood auger bits and small space storage rack. Patented spring steel clips hold bits in place. Hole sizes make selection sure and easy. Steel rack fits 8" x 10¼" area and screws easily to wall or bench. Boring range of 13 bits, ¼" to 1".



Write for Free Irwin Catalog No. 52. Makes ideal reference guide.

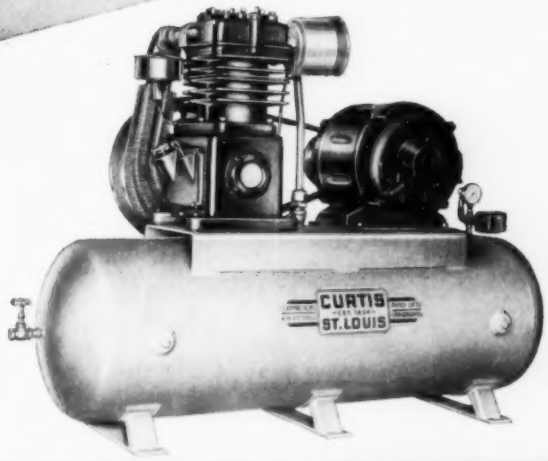
IRWIN Wilmington, Ohio

the original solid center auger bit
•
screw drivers
screw driver bits

train young men with Curtis equipment

CHANCES ARE THEY WILL WORK WITH IT LATER

precision made with 103 years of experience



NEW CURTIS "CV"

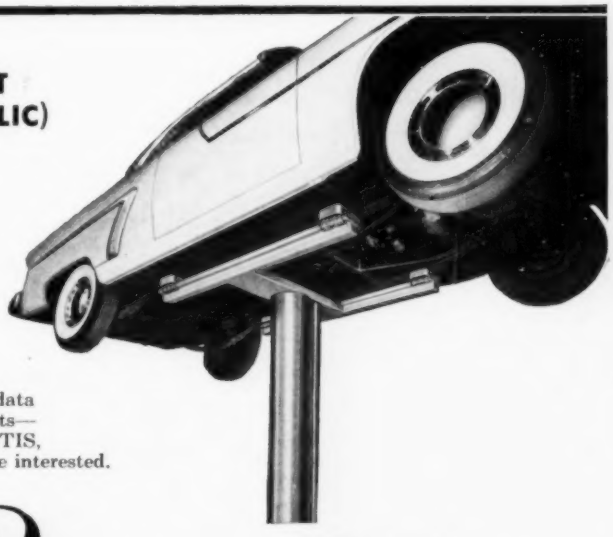
¼ thru 15 H.P.

FEATURES:

- Positive unloader (not affected by Power Failure)
- Timken main bearings
- Centro-Ring Pressure Oiling
- ASME Tank with ASME Safety Valve

ALL-PURPOSE SINGLE POST FRAME LIFT (FULL HYDRAULIC)

Provides maximum accessibility to speed up shop work *and* costs less to buy—less to install than any type of two-post Lift. 60″ wheelbase range.

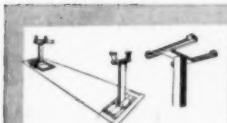


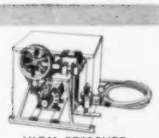
For complete technical data on any CURTIS products— mail a post card to CURTIS, listing products in which you are interested.

Remember YOU CAN COUNT ON **Curtis**

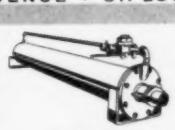
MANUFACTURING COMPANY • PNEUMATIC DIVISION

1909 KIENLEN AVENUE • ST. LOUIS 20, MO. CM-8


AUTO LIFTS SINGLE AND TWO POST


HIGH PRESSURE CAR WASHER

INDUSTRIAL AIR COMPRESSORS


AIR HOISTS AIR CYLINDERS

PACKAGED AND REMOTE AIR CONDITIONING EQUIPMENT

Electrical-Shop Equipment, Supplies, and Motor Testing Equipment

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films and silent or sound movies may be used by the students in the industrial arts and vocational education courses.

BENCH GRINDER

BENCHES — plain or with drawers, for tools and equipment, or with compartments for the storing of wiring panels. Preferably they should have electrical outlets

BITS
1. Auger, ¼ in. to 1 in. by 16ths
2. Auger, $1\frac{1}{16}$ in., 18 in. long
3. Drill for wood, square shank, ⅛ in. to ½ in. by 16ths
4. Expansion
5. Extension, 18 in.
6. Screw driver, ¼ in.

BLACKBOARD — permanent or portable

BLOWTORCHES — 1-qt. size

BOOKCASE

BRACES — ratchet type, 8-in. swing

BULLETIN BOARD

CABINETS — wood or metal for filing class records, instruction sheets, drawings, etc.

CHAIRS — teacher's and tablet arm

COMPASS SAW

COIL
1. Spreader
2. Taper
3. Winder

DESK — teacher's, with drawer compartments

DRILL
1. Breast
2. Concrete, ⅜ in., ½ in., ¾ in., 1 in.
3. Hand
4. Portable, electric
5. Twist, 1/32 in. to ½ in. by 64ths

DRILL PRESS
1. Bench, hand, or power driven
2. Heavy, power driven

FILES

FIRST-AID CABINET AND SUPPLIES

HACK SAW
1. Blades, 10 in., 24 tooth
2. Frames adjustable

HAMMERS
1. Claw, 12 oz.
2. Machinist's, ball peen

HICKEY — ½ in. and ¾ in.

HOLE SAWS — selected sizes

LATHE
1. Engine, 10-in. or 12-in. swing, 6 ft. or 8 ft. long
2. Speed

PLIERS
1. Gas, 6½ in. and 8 in.
2. Side cutting, 6 in.

PUNCH — for metal molding

PUNCHES — assorted

REAMERS
1. Pipe burring, ¼ in. to 1 in.
2. Pipe burring, ½ in. to 2 in.

RULES
1. 48 in. zigzag
2. 72 in. zigzag

SCREW DRIVERS — 3 in., 5 in., and 8 in.

SHEARS — for cutting metal molding

SOLDER DIPPERS

SOLDERING COPPERS
1. Assorted
2. Electric
3. Handles

STOCKS AND DIES — for pipe threads, ½ in. to 1 in.

VISES
1. Machinist's, 4 in.
2. Pipe

WRENCHES
1. Adjustable, 6 in. and 8 in.
2. Pipe, 10 in., 12 in., and 14 in.
3. Socket, combination

Electrical Shop — Supplies

ABRASIVE CLOTH — aluminum oxide, 1, 1½, and 2 in. wide

ARMORED CABLE
1. 2 wire, No. 14, single strip
2. 3 wire, No. 14, single strip
3. Box connectors

ATTACHMENT PLUG

BAR HANGERS

BATTERIES — dry cells

BATTERY ACID — 1.300

BATTERY SEALING COMPOUND

BOX CLEATS

BRADS — ¾ in., No. 19 and 1½ in., No. 16

BRAKE LINING — ¼ by 2 in.

BRUSHES — carbon, for motors and generators

BURGLAR CONTACTS
1. Open circuit
2. Closed circuit

BUSHINGS
1. Loom, No. 1 and No. 2
2. "Jiffy" loom, No. 2

BUZZERS

CLEATS — unglazed porcelain, 2 wire

CLIPS — test, with insulators, Universal, Nos. 22, 23, 24 and 25

COMMUTATOR CEMENT

CONDUIT
1. Bushings, ½, ¾, and 1 in.
2. Box connectors, for flexible
3. Couplings, for flexible
4. Lock nuts, ½, ¾, and 1 in.
5. Rigid, ½, ¾, and 1 in.

CONDULET
1. Fillings, ½ in., LL, LR, and LB
2. Covers, ½ in., blank

DOOR OPENERS — mortised

FISH PAPER — .0125 in. thick

FIXTURES — brass, chain, suspension

FIXTURE STUDS

FUSES
1. Plug type, renewable, 125 volt, 15 amp.
2. Cartridge type, renewable, 125 volt, 30 amp.
3. Renewals for plug fuses
4. Renewals for cartridge fuses

GROUND CLAMPS — ⅜ to 1 in. assorted

HICKEY GRIPS — ½ and ¾ in.

LAMPS
1. Mazda, selected as wattages and voltages
2. Guards for brass sockets

LEATHER NAIL HEADS

LUGS — 25 and 50 amp.

LUMBER — 2 by 4 in. by 14 ft., No. 1, white pine dressed, 4 sides

MOLDING
1. Metal
2. Metal, fittings — crosses, T's, internal elbows, junction boxes, switch bases, keyless receptacles, snap switches

NAILS — roofing

NUTS — iron, 4–36, 6–32, 8–32, 10–24, 12–24, 10–32, 14–20

OUTLET BOXES — 4 in. square, with one round blank cover, and one cover with bushed opening

PIPE STRAPS — galvanized, ⅜, ½, ¾, and 1 in.

PUSH BUTTONS
1. Return call, 3 point
2. Single

RECEPTACLES
1. Flush, duplex
2. Porcelain cleat, 660 watt, 250 volt
3. Concealed
4. Covers

RECTIFIERS — Tungar, for charging from 1 to 12, 6- and 12-volt batteries

RELAYS — Dixie

RESISTANCE BOARDS — for testing

RESISTANCE UNITS — 125-ohm

RHEOSTATS
1. Compression, 275 watt
2. Field, for shunt and compound motors

ROSETTES — wood

ROTARY CONVERTER — 5-kw. capacity, 3 phase a.c., 110 volt d.c.

SCREWS
1. Anchors, 8/32, 10/24, 12/24, 14/20
2. Machine, roundhead, 4–40 by ¼ in., 6–32 by ½ in., 6–32 by ¾ in., 8–32 by ⅜ in., 8–32 by ½ in., 8–32 by 1 in., 10–32 by ⅜ in., 10–24 by ⅜ in., 10–24 by ¾ in., 10–32 by ¾ in., 12–24 by 1 in.
3. Machine, brass, roundhead, 4–40 by ¼ in., 6–32 by ½ in., 6–32 by ¾ in., 8–32 by ½ in.
4. Wood, flathead bright, No. 5 by ¾ in., No. 8 by ½ in., No. 8 by ¾ in., No. 8 by 1 in., No. 7 by 1½ in., No. 8 by 1½ in., No. 7 by 2 in.
5. Wood, roundhead blued, No. 7 by 1 in., No. 8 by 1½ in., No. 10 by 1½ in., No. 7 by 2 in.

SLEEVING — No. 1, white; No. 1, blue; and No. 1, red

SOCKETS
1. Brushed, brass pull chain, keyless, key
2. Porcelain, keyless, with caps
3. Porcelain, key, with caps

SOCKET CAPS — ¼ and ⅜ in. bushed

SOLDER WIRE — 50/50 size, No. 10

SOLDERING PASTE — 2-oz. cans, noncorrosive

SOLDERING SALTS — 1-oz. cans, noncorrosive

SPEED COUNTERS — 0–9999

SPLIT KNOBS — porcelain

SPRING BALANCES — 0–30 lb.

STARTING BOXES
1. For compound motors, various makes
2. For shunt wound, 1 h.p., 110-volt motors Overload release
3. For shunt wound, 1 h.p., 110-volt motors. No voltage release
4. Starting devices of various makes and principles, for 1 h.p., 3-phase, 220-volt a.c. motors

STORAGE BATTERIES — 6 volt

SWITCH
1. Battery, 4 point
2. Bases, porcelain, for 10-amp. switches
3. Boxes, 2¾ in. deep
4. Entrance, safety, 2 pole, 30 amp., with 2-branch lighting circuits
5. Entrance, safety, 3 pole, 30 amp., 250 volt
6. Flush, push button, S.P., D.P., 3 way, 4 way
7. Surface, S1, S3, and S4
8. Knife, type A, D.P.S.T., D.P.D.T., S.P.S.T., and S.P.D.T.
9. Surface, snap, electrolier
10. Surface, snap, S.P.D.P., 3 way, 4 way

SWITCHBOARD — as required

TACKS — double-pointed No. 10

TAPE
1. Friction, ½-lb. rolls
2. Rubber, ½-lb. rolls

TELEGRAPH SETS — including sounders, keys, and relays

TELEPHONES
1. Complete bridging, independent phones

(Continued on page 40A)

DIAMALLOY

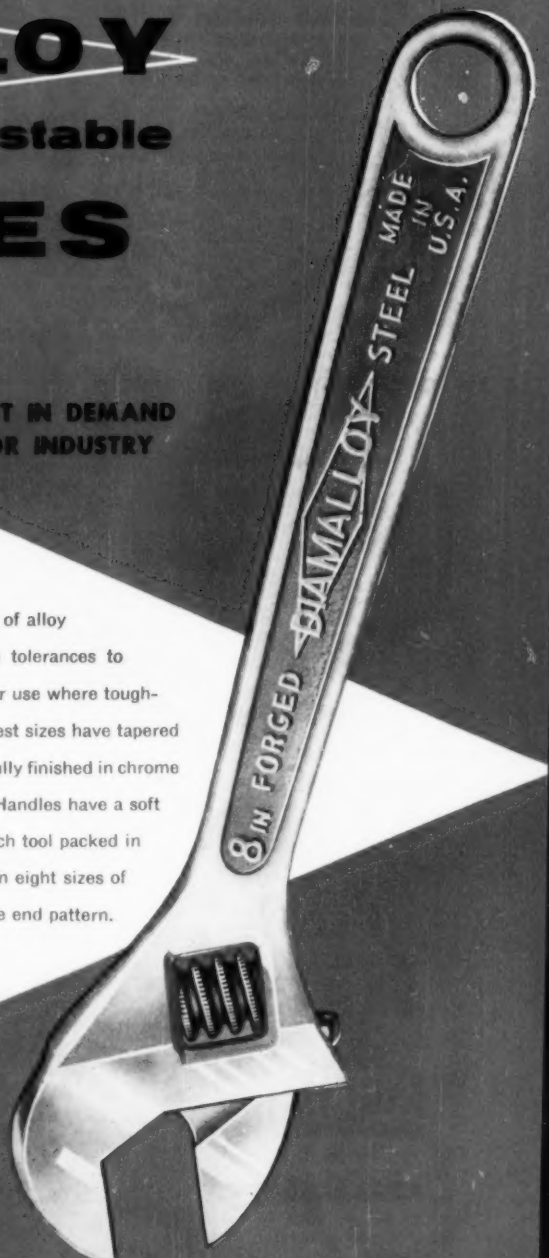
Featherweight Adjustable

WRENCHES

DIAMOND®

FIRST IN DEMAND FOR INDUSTRY

Drop forged of the finest grade of alloy steel obtainable. Carefully machined to close tolerances to insure smooth operation and dependable service. For use where toughness and extra strength is required . . . The three largest sizes have tapered handles for better balance and ease of operation . . . Beautifully finished in chrome nickel with sides of head polished to a high lustre. Handles have a soft velvety finish, pleasing in appearance . . . Each tool packed in an attractive individual carton . . . Made in eight sizes of single end, and in four sizes of double end pattern.



SPECIFICATIONS

SINGLE END

Size In.	Number	Capacity Inches	Thickest Pt. of Head In.	Tip of Jaw Inches	Weight per Dozen
4	D 74	½	⅜	½	1 lb. 5 oz.
6	D 76	⅞	½	⅝	3 lbs.
8	D 78	1⅛	⅝	¾	5 lbs. 12 oz.
10	D710	1⅜	¾	⅞	10 lbs. 2 oz.
12	D712	1⅝	⅞	1	17 lbs. 7 oz.
15	D715	1⅞	1	1⅛	38 lbs. 6 oz.
18	D718	2⅛	1⅛	1⅜	69 lbs. 12 oz.
24	D724	2⅝	1⅜	1⅝	110 lbs.

DOUBLE END

4-6	DB 76	½-⅞	⅜-½	½-⅝	3 lbs.
6-8	DB 78	⅝-1⅛	½-⅝	⅝-¾	6 lbs.
8-10	DB710	⅞-1⅜	⅝-¾	¾-⅞	11 lbs. 8 oz.
10-12	DB712	1⅛-1⅝	¾-⅞	⅞-1	20 lbs. 2 oz.

"There is nothing finer than a DIAMOND"

DIAMOND TOOL

and Horseshoe Co.

DULUTH, MINN. EST. 1908 TORONTO, ONT.

(Continued from page 38A)

2. Couch vestibule telephones
3. Receivers, transmitters, induction coils, condensers, and bridging switch hooks

TRANSFORMERS
1. Bell ringing, 6, 8, 14 volt
2. Single phase, 110–220 volt, S.K.V.A.

TUBES — porcelain, 5/16 by 3 in., 5/16 by 5 in., and 5/16 by 10 in.

TUBING — flexible nonmetallic, 1/4 and 3/8 in.

WASHERS
1. Iron, 1/4 and 3/8 in.
2. Brass, 1/4 and 3/8 in.

WIRE
1. Annunciator, No. 18 or No. 20
2. Fixture, No. 18, single yellow, with marker
3. Rubber covered, solid copper, No. 10, black
4. No. 10, white
5. No. 14, black
6. No. 14, white
7. Rubber covered, No. 16, brewery cord
8. No. 18, lamp cord, green and yellow
9. S.C.C. copper magnet, enameled, sizes Nos. 16 to 26 inclusive

Electrical Shop — Motor and Testing Equipment

ANNUNCIATORS
1. Automatic needle drop
2. Gravity drop
3. Manual needle drop

ARMATURES — burnt out, for repairing

BATTERY CHARGER — commercial

CIRCUIT BREAKERS
1. Air, single pole, overload, 25 amp., 550 volt
2. Air, single pole, underload, 15 amp., 550 volt

CONTROLLERS
1. For multiple-speed motor
2. For 1 h.p., 110-volt series

GENERATORS
1. Motor-generator set, 10 h.p. to supply 110-volt d.c. for testing purposes, battery charging, etc.
2. Generator, 6-volt d.c. coupled to an a.c. motor for 6-volt circuit testing
3. Auto generators of different makes

GRAVITY CELLS

MAGNETS — testing, 10,000 ohm

METERS
1. Ammeter, standard, 60 amp., a.c.
2. Ammeter, standard, 60 amp., d.c.
3. Ammeter, student, 60 amp., a.c.
4. Ammeter, student, 60 amp., d.c.
5. Voltmeter, standard, 0–10 volt, d.c.-a.c.
6. Voltmeter, standard, 110–220
7. Voltmeter, standard, 125 volt
8. Voltmeter, standard, 125 volt, d.c.
9. Voltmeter, student, 110 volt, d.c.
10. Voltmeter, student, 110 volt, a.c.
11. Wattmeter, standard, 110–220 volt, 30–60 amp., d.c.-a.c.
12. Wattmeter, student, 110–220 volt, 30 amp., a.c.-d.c.
13. Watt-hour meter, 125 volt, 5 amp., a.c., single phase, various makes

MOTORS
1. Auto starter, different makes
2. Burnt out, fractional h.p., 110 volt, 60 cycle, for repairing
3. Compound, 1 h.p., 110 volt, d.c.
4. Multiple speed, 1 h.p., 3 phase, 220 volt
5. Series, 1 h.p., 110 volt, d.c.
6. Shunt, 1 h.p., 110 volt, d.c.
7. Split phase and repulsion, a.c., 110 volt, single phase, assorted
8. Split phase induction motors, fractional h.p., 110 volt, 60 cycle, different makes
9. 3 phase, 1 h.p., a.c., 220 volt, various makes
10. 3 phase, 2 h.p., 220 volt, a.c., various makes
11. Universal, fractional h.p., 110 volt, different makes
12. Universal, variable speed, 1/2 h.p.

PLATFORM SCALE — 110 lb. capacity

PLANNING A NEW OR EXPANDED ELECTRIC SHOP?
you'll want this NEW STANDARD catalog
flexlab electric supply and distribution equipment
FOR HIGH SCHOOL ELECTRIC SHOPS
STANDARD
THE STANDARD ELECTRIC TIME

Just off the press! New sixteen page, two color catalog, profusely illustrated, contains a wealth of useful information, including:

- Suggested shop plan.
- Recommended shop equipment.
- Illustrations, information and specifications on STANDARD:
  - SWITCHBOARDS • ENCLOSURES • SERVICE OUTLETS
  - DYNAMOMETERS • MOTOR-GENERATOR SETS

A copy is yours for the asking.

THE STANDARD ELECTRIC TIME COMPANY

89 LOGAN STREET • SPRINGFIELD, MASSACHUSETTS

NEWS NOTES

(Continued from page 36A)

♦ *Free or Inexpensive Teaching Devices in the Field of Metalworking* is an extensive and up-to-date listing of teaching devices in the field of metalworking and the industrial sources from which they may be obtained. The devices consist of technical literature, student projects, safety instruction, wall charts, shop plans, and guidance discussion topics designed to assist the teacher in extending his instruction.

This 13-page release may be secured, without cost, by writing to the *Department of Industrial Education, College of Education, Wayne State University, Detroit 2, Mich.*

This excellent list was compiled by Robert Kirchner, of the Mu Sigma Pi Mathetes.

SPECIFY
BUILT for ACCURACY

Hotpack TRADE MARK

EQUIPMENT
AND LONG SERVICE

HEAVY DUTY

No. 7021

NEW HIGH TEMP. KILN

Temperature to 2350° F.

Fast come-up time 5 hrs. to 2300° F. 7" of insulation, including interlocked 2500° F. brick. Controls grouped in eye-level panel, recessed with special plexiglass cover to prevent unauthorized adjustment while in operation. Many other features.

SPECIFICATIONS

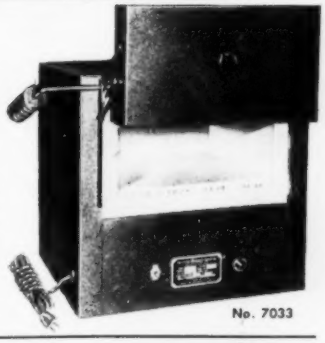
Interior Size	Watts	Price F.O.B. Phila.
10"x9½"x9"	28KW 230 volts	$225.00

NEW IMPROVED METAL ENAMELING KILN

Fast come-up time, 60 minutes to 1500° F. Uniform heating from floor refractory; high grade coiled heating elements. Unique front door opening prevents heat loss, eliminating possibility of dangerous accidents. Many other features.

SPECIFICATIONS

Interior Size	Watts 115 V	Price F.O.B. Phila.
12"x11"x5"	12 Amps	$85.00



No. 7033

PLASTIC PRE-HEATING Electric PORTABLE OVEN

No. 600

For preheating Methyl Methocrylate in sheet or rod form where it is necessary to maintain even temperature throughout the sheet especially desirable in compressed air, vacuum or pressure forming techniques.

The Oven is controlled by a newly developed thermostatic control, sealed in and conveniently placed on the front panel, of the Oven. It can accurately be set at any desired temperature where a quick rate of heat up to 306° F. is desired.

Due to the Aluminum Construction, the Oven is very light in weight and can be carried from the room or project to project. As it operates on 110 volt AC or DC, it can be plugged into any 110 volt receptacle.

SPECIFICATIONS

Model	Interior Size	Wattage 110 AC-DC	F.O.B. Phila. Price
600	12"Wx12"Dx12"H	700	$ 90.00
602	24"Wx12"Dx12"H	1400	145.00

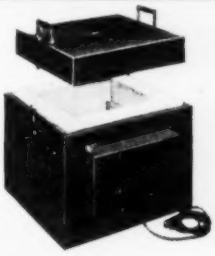
Hotpack KILN KIT

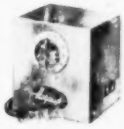
EVERYTHING YOU NEED TO MAKE THIS PROFESSIONAL LOOKING ELECTRIC KILN

Large Chamber: 12" deep, 11" wide, 9" high

YOU GET: Illustrated instruction Manual, Insulating Back Up Material, Insulated Cover & Handle, Wire — Screws — Terminal Board, Insulating Brick — cut to size, Sheet Metal Case — welded & painted, Hotpack Heating Elements, wired, 15 amps — 115 volts — Ready to install.

Prices Including Freight and Crating:
East of Denver — $52.00 West of Denver — $60.00





YOU NEVER FORGET to turn off your kiln with the

HOTPACK LIMITOR

Plug-in Type, 115 v., $14.95 Wire-in Type, 220 v., $27.95

No. 15

ELECTRIC PLASTIHEETER

Designed for Use in Plastic Courses in the School — a commercial type strip heater designed to heat sheets of Plexiglass or Lucite until they become soft and pliable for shaping to the form desired. It is essentially used for straight line bends or folds and is capable of heating sheet material up to ⅛" thickness in from 30 seconds to 4 minutes depending on the thickness of the contact with the heating element and the platen remains cool, there is no possibility of creating mark-off on the sheet.

SPECIFICATIONS

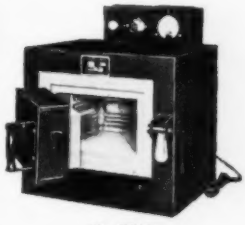
No.	Working Space	Overall Size	Wattage 115 Volt	Shipping Weight	F.O.B. Phila.
15	18"Lx5"Wx2½"H	21"Lx7"Wx3½"H	200 W	4 lbs.	$22.50
16	30"Lx5"Wx2½"H	32"xLx7"Wx3½"H	350 W	6 lbs.	35.00

CONTR. TEMP. KILN FOR ENAMELING ON COPPER

These units provide manual adjustment of temperature for kilns. They may be regulated so that current may be supplied to the kiln for any percentage of time per minute. This method of selection provides exact temperatures because the slightest movement of the control knob will vary the time of input, thereby raising or lowering the temperature as desired.

SPECIFICATIONS

Model	Interior Size	Price F.O.B. Phila.
7069	12"x12"x5½"	$170.00
7066	8"x 8"x5½"	130.00



No. 7066

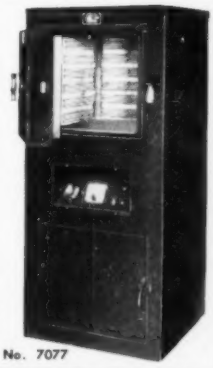
Hotpack ELECTRIC HEAT TREATING FURNACE

For Hardening, drawing, tempering and annealing or normalizing of dies, punches, gages, fixtures or other parts are performed readily with these redesigned Hotpack Electric Box Furnaces.

This new Hotpack Electric Furnace is fast heat-built for continuous use from 300° to 2000° F. It is the only Furnace equipped with Automatic Controlling-Indicating Pyrometer and also with Limistat control in this price field.

SPECIFICATIONS

Model	Interior Size W. D. H.	Current Characteristics	Prices F.O.B. Phila.
7076	8"x 8"x 5½"	110 V AC 15 Amp.	$265.00
7074	8"x 8"x11"	115 V AC 15 Amp.	295.00
7075	12"x12"x11"	220 V AC 23 Amp.	430.00
7077	15"x15"x16½"	200 V AC 30 Amp.	640.00
7079	12"x12"x 5½"	110 V AC 15 Amp.	305.00



No. 7077

Hotpack ELECTRIC CERAMIC KILNS

No. 7004

1. Eye level controls — pilot light. 2. Built-in pyrometer for visible accurate temperature indication. 3. Handles are cool to touch. 4. Control switch — low, medium, and high heat for even distribution. 5. Special insulation holds heat and prevents scorching of table top. 6. Maximum temperature 2050° F.

Enameling on copper can be efficiently fired on our models No. 7006 and 7009.

SPECIFICATIONS

Model No.	Interior Size	Shelves Furnished	Approx. Time	Price F.O.B. Phila.
7006	8"x 8"x 5½"	1	3 hrs.	$ 85.00
7004	8"x 8"x11"	2	4 hrs.	115.00
7005	12"x12"x11"	2	3 hrs.	250.00
7007	15"x15"x16½"	3	4 hrs.	460.00
7009	12"x12"x 5½"	1	4 hrs.	125.00

WRITE FOR COMPLETE DETAILS — SEND FOR CATALOG

THE ELECTRIC Hotpack COMPANY, INC.

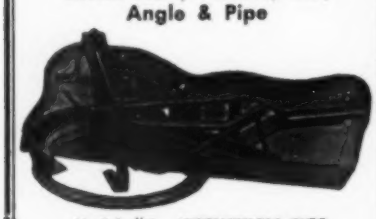
5067 COTTMAN AVENUE • PHILADELPHIA 35, PA.

a School Shop "must"

HOSSFELD

UNIVERSAL® IRON BENDER

Bends Flats, Rounds, Bar, Angle & Pipe



Model #1 — WRENCHLESS TYPE

SAMPLES OF BAR BENDING

Simulate in the shop the 101 different bending jobs your students will be called on to perform in repair, maintenance and production work. Teach them to make neat, quick and accurate round or square cold bends on pipe, conduit and ornamental iron work. Make them proficient in forming "U" Bends, eye bolts, angle iron, automobile spring eyes, heavy bends, sharp square and 90° bends, and a host of others. The Hossfeld Bender has been proved over the years in metalworking, welding and repair shops. It replaces special machinery, and is as practical and indispensable as a shop vise.

GET THE FACTS!

Write today for bulletin giving operating instructions, specifications and capacities of the models available, and die and parts list.

HOSSFELD

MFG. CO.

438 W. 3rd Street

Winona, Minnesota

AUTOMOTIVE EQUIPMENT

(Continued from page 34A)

TAPE
1. ¾" friction tape
2. ¾" rubber tape

TIRE REPAIR KIT
Garage size, red, 450 sq. in., ¼ pint cement

TIRE REPAIR CEMENT
½ pint can with brush in can

THERMOMETERS (Lab.)
Calibration 10° F.-220° F., 12" length, glass stem

TUBING FITTINGS
1. Flare nuts, 7/16" x 20 for ¼" sae flared fittings
2. Half union, ¼" sae flare x ⅛" standard pipe
3. Shut-off cocks, ¼" D.D. tubing on each end, compression type
4. Shut-off cocks, ¼" D.D. tubing on each end, sae flare type
5. Unions, ¼" compression type x ½" compression type
6. Unions, ¼" sae flare x ¼" flare
7. Unions, 5/16" sae flare x 5/16" flare
8. Unions, 5/16" compression type x 5/16" compression type
9. Shut-off cocks, 5/16" O.D. tubing on each end, compression type
10. Shut-off cocks, 5/16" O.D. tubing on each end, sae flare type
11. Sleeves, 5/16", compression sleeves
12. Nuts, 7/16" x 20 nuts for ¼" O.D. compression fittings
13. Flare nuts ½" x 20 for 5/16" sae flared fittings
14. Half union, ¼" tubing size, compression x ⅛" standard pipe
15. Half union, 5/16" tubing size, compression x ¼" standard pipe
16. Sleeves, ¼" compression sleeves

TUBING
1. ¼" O.D. annealed copper, automative
2. 5/16" O.D. annealed copper, automotive
3. 2¼" O.D. flexible metal, galvanized steel for exhaust lines

WASHERS, FLAT
1. ¼", 18 gauge thickness
2. 5/16", 16 gauge thickness
3. ⅜", 16 gauge thickness
4. 7/16", 14 gauge thickness
5. ½", 14 gauge thickness

WASHERS, LOCK
1. ¼"
2. 5/16"
3. ⅜"
4. 7/16"
5. ½"

WIRE
1. No. 18 single strand copper, cotton covered
2. No. 24 single strand copper, single cotton and enamel covered
3. Resistance wire, chromel No. 27, 3.25 ohms per ft.
4. Bonding wire, annealed iron, stove pipe No. 16

Hand Tools

Numerous hand tools are needed in an auto shop since this is a service trade. Tools should be the type used currently in the trade and should be sturdy, simple and practical. In purchasing tools, particular attention should be given to the alloy content, heat treatment, and guarantee.

(Continued on page 52A)

new! from DELMAR

BLUEPRINT READING AND SKETCHING ELECTRICAL TRADES

COMMERCIAL

FOR Day — Trade Apprentice; Evening — Adult Home Study.

Here is a work-textbook and study guide written SPECIFICALLY for Commercial Installations—incorporating the latest National Electrical Code.

Each book contains a set of 11 full-size blueprints of a modern commercial building including a Doctor's office, Bakery, Beauty Salon, Insurance office, etc.

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PLUMBING TRADES

A revision and expansion of Mathematics for Plumbers. So as not to disturb existing courses of study, the page sequence will remain the same as in the old workbook.

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by Slater

The first of a series of three text-workbooks in related theory for Plumbers and Pipefitters.

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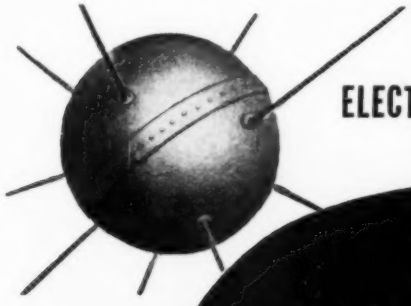
for the finest in Related Instruction

DELMAR

PUBLISHERS INC.

ALBANY 5, N. Y.



ELECTRICITY AND ELECTRONICS FOR EVERY SCHOOL

The need for better technical education programs grows increasingly urgent— *here's why Crow equipment meets that need best*

1. It permits you to start an Electricity and Electronics program *immediately*. No delay and large capital expense for remodeling, buying special work benches, installing distribution panels, etc.

2. It eliminates the additional delay and expense of preparing course materials. Each "package" of Crow equipment includes a text manual which outlines the course and describes each experiment in both words and pictures.

3. It is designed specifically for educational purposes. Viewed in terms of student understanding, Crow equipment is far more effective than commercial equipment costing many times as much.

4. It safeguards your program against obsolescence . . . provides the "blocks" to build a flexible, long range program which can be readily expanded as enrollment swells and new courses are added.

5. It makes Electricity and Electronics an exciting adventure in learning. Abstract theories are translated into practical experiments that arouse and maintain student interest.

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UNIVERSAL SCIENTIFIC COMPANY, INC.
1102 Shelby Street • Box 336G • Vincennes, Indiana

Crow also offers a free Shop Planning Service—expert consultation on any and all phases of your Electricity and Electronics training program, present or planned. Write for questionnaire. Complete information on Crow equipment also available on request.

New Publications

Sound (One of the Basic Science Series)

By Dr. Alexander Efron. Paper, 80 pp., 5½ by 8½ in., illus., $1.25. John F. Rider Publisher, Inc., New York, N. Y.

This book gives a complete treatment of the subject starting with an introduction to sound, and covering hearing, speech and music, with a full discussion of the wave nature of sound. The text provides a comprehensive study of the physics of sound including such topics as sources of sound energy, the ear, perception of pitch, loudness, quality, standing waves, interference, and resonance.

Shop Tools — Care and Repair

By DeWitt Hunt. Cloth, 252 pp., 7⅝ by 9¾ in., illus., $4.20. D. Van Nostrand Co., Inc., Princeton, N. J.

This excellent text is well illustrated and clearly written so that the home craftsman can learn how to keep his hand and power tools in good condition at all times.

The author has a wide experience as a craftsman and as a teacher, and his book shows the painstaking care which he has put into it.

The 14 sections into which the book has been divided explain the subject matter under the following headings: preventive maintenance on hand tools; sharpening hand tools and household equipment; tool handles; sharpening hand saws; marking tools for identification; selection, use, and maintenance of abrasive equipment; problems of electrical maintenance; general machine maintenance; lubrication as a factor in maintenance; band saw maintenance; circular saw maintenance; care and upkeep of jointers; surfacers and shapers; and miscellaneous maintenance tasks.

The book contains tables on actual sizes of triangular files, comparative hardness figures for materials, size and number of wires in extension cords, Stubbs sheet-metal gauge and recommended gauges for circular and band saws, and recommended speeds for various types of circular saws.

Farm Welding — Arc and Oxyacetylene Welding

By Marvin M. Parker. Cloth, 262 pp., 6¼ by 9¼ in., illus. McGraw-Hill Book Co., Inc., New York, N. Y.

This text will be found especially useful in rural schools where the students need preparation for their future work on the farm. In rural areas much of the repairs on tools and machinery must be done directly on the farm, and welding equipment is practically an absolute necessity as a great time and money saver.

The book is divided into three parts, the first of which presents the subject under the title "Metals and Welding." Part two is on "Arc Welding," and Part three is on "Oxyacetylene Welding and Cutting."

The author has given his explanations and directions in clear-cut language, and the illustrations are very good.

How to Read Schematic Diagrams

By David Mark. Paper, 160 pp., 8½ by 5½ in., illus., $3.50. John F. Rider Publisher, Inc., New York, N. Y.

This book is intended for elementary and high-school students who are interested in electronics, experiments, hobbies, and technical and industrial subjects. It acquaints them with electronic symbols and diagrams.

The book presupposes no prior knowledge of electricity or electronics. It explains the basic theory appropriate to the subject, symbolism, technical notations and organization of schematics in pictorial diagramatic form. The reader is carried through the text on a progressive basis, being taught how to recognize symbolized as well as pictorial and schematic representations of electronic components.

Standard I.R.E. and industry accepted symbols are used throughout. Items such as batteries, lamps, switches, relays, fuses, transformers, capacitors, motors, generators, and resistor vacuum tubes, metallic rectifiers, and a host of other electronic components are explained.

Heat (One of the Basic Science Series)

By Dr. Alexander Efron. Paper, 112 pp., 5½ by 8½ in., illus., $1.50. John F. Rider Publisher, Inc., New York, N. Y.

Starting with the historical development of heat concepts, this book covers such topics as thermometry, calorimetry, change of state, thermodynamics, and heat engines. Development of the subject follows logically from discussion of heat and temperature, sources of heat, thermal stresses, etc., to advanced concepts and their application to such modern heat engines as the turboprop, ramjet, and rocket.

Hobby Tools and How to Use Them

By Robert Gorman. Paper, 95 pp., 6⅛ by 8⅞ in., illus., 75 cents. X-acto, Inc., Long Island City, N. Y.

This book is for the hobbyist and describes ship modeling, whittling, model airplane building, leathercraft, linoleum block printing, metalwork, stenciling, silk screen, and other interesting subjects.

(Continued on page 50A)

Here's Practical Equipment For Your Graphic Arts Shop

CHALLENGE offers you equipment that has proven to be practical in hundreds of school shops throughout the country. Sturdy, practical, yet reasonably priced. . . Challenge gives you the best instruction tool value for your equipment dollar.

FOR PAPER CUTTING

Challenge offers you the widest range of both hand lever and power cutters in the sizes and types most widely used by school shops. Also available are special safety controls designed specially for school needs.

FOR PRESSWORK AND PROOFING

Thirteen different models of proof presses are also available. These can also be used for cylinder presswork instruction, for short run jobs, as well as making offset and duplicator plates direct from type forms.

FOR COMPOSING ROOM AND BINDERY WORK

In addition, Challenge offers a wide range of paper drilling machines for drilling and cornering of loose leaf sheets; also Quoins, Keys, Iron Furniture, Galleys and Galley Cabinets for your composing room and job make-up activities.

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Please send your helpful information on—

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Name _____ Title _____
School _____
Address _____
City _____ State _____

Metalworking Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films, and silent or sound movies may be used by the students in the industrial arts and vocational education courses.

AIR COMPRESSORS — for machine shop, foundry, or forge shop
ANVIL — 100 lb.
ARBOR PRESS — bench or pedestal type
BARROWS
1. Coke
2. Foundry
3. Scrap
BENDER — For bending bar, flat metals, and tubing.
Accessories for benders
Stand for bender
BELT LACER
BENCHES
1. Coremaking
2. For metal working, iron or steel legs. Tops, metal or hardwood lumber, 1¾ in. to 2½ in. thick
3. Molding
BLOWERS — for furnaces, forges, etc.
BLOWTORCH — 1-qt. size
BOOKCASE — for reference books, catalogs, etc.
BORING BAR
BORING MILL — vertical or horizontal
BRAKES — Box and pan
Stand for brake
BULLETIN BOARD
CABINETS — wood or metal, for filing class records, instruction sheets, drawings, etc., and for tools and supplies
CASEHARDENING BOXES
CENTERING MACHINE
CHAIN HOISTS — differential, duplex or triplex
CHAIRS — teachers', and tablet arm if needed for related-subjects room, or for demonstration section
CHALKBOARDS — permanent or portable
CHUCK
1. Drill, selected sizes
2. Lathe, combination, 4 jaw, selected sizes
3. Lathe, independent, 4 jaw, selected sizes
4. Lathe, universal, 3 jaw, selected sizes
5. Milling machine, universal
CORE OVEN — for foundry
CRANES AND HOISTS — air, electric, or hand; of the jib, traveling, or portable type
CUPOLA — for foundry, coke, or electric, ¼- to 1-ton capacity
DESK — teacher's, with drawer compartments
DIE-FILING MACHINE
DIVIDING HEAD
DRILLS
1. Bench, hand
2. Breast
3. Electric, portable
4. Hand
5. Post, hand or power
6. Radial
7. Sensitive
8. Upright, power
FLASKS — 2 or 3 part, steel or snap type
FORGE — coal or gas, with hand- or electric-driven blower
FURNACES
1. Annealing
2. Bench
3. Brass and soft metal
4. Combination bench
5. Casehardening
6. Cyanide
7. Gasoline
8. Heat-treating
9. Melting
GEAR-CUTTING MACHINE
GRINDER
1. Bench, hand or power driven
2. Combination grinder, buffer, and polisher
3. Emery, bench or pedestal type
4. Face, with magnetic chuck
5. Portable tool post
6. Precision, for external and internal grinding
7. Universal tool cutter, drill and reamer grinder
8. Wet tool
HACK SAW — motor or belt driven
HAND PICKS — for cleaning inside of cupola, 1¼ to 2½ lb.
HARDNESS TESTING MACHINE
LATHES — belt or individual drives
1. Automatic
2. Bench, 6-in. to 11-in. swing, 11 in. to 36 in. between centers
3. Change gear, 9-in. to 14-in. swing, 18 in. to 36 in. between centers
4. Quick-change gear, 9-in. to 16-in. swing, 18 in. to 36 in. between centers
5. Semiquick-change gear, 9-in. to 18-in. swing, 18 in. to 42 in. between centers
6. Turret
7. Metal spinning
MILLING MACHINE
1. Plain, cone or motor-driven type
2. Universal, cone or motor-driven type
NIBBLING MACHINE
NOTCHER — Capacity, 16 mild steel; 90 degree notch (maximum 6 by 6 in.)
Stand for notcher
PIPE CUTTER
PLANER — belt or motor driven
POWER HAMMER — for forging operations
PRESS — For stretch forming, free blowing, blow molding, and vacuum forming thermoplastic sheet materials.
PUNCHES — metal, hand, or power
PYROMETER
PYROSCOPE
RELIEVING ATTACHMENT FOR LATHE
ROLLERS — 16", 18", 24", 30", and 36-in. forming width; for 16", 18", 20", and 22-gauge mild steel capacity respectively
Stand for rollers
SAND SIFTER — for foundry, hand or power
SANDBLAST OUTFIT — with cabinet
SCALE
1. Counter for machine shop
2. Platform, for foundry, 1000-lb. capacity
SHAPER
SHEARS — Capacity, 16-gauge mild steel; shearing width 6, 9, 12, and 24-in.
Stand for shears
SNAP-FLASK JACKETS — to fit snap flasks used
STRAIGHTENING PRESS
SURFACE PLATES
SWAGE BLOCK AND STAND — for forge shop
TAPER ATTACHMENT FOR LATHE
TRUCK — warehouse
TUMBLING BARREL — for foundry
VISES
1. Blacksmith
2. Drill press
3. Machinist
4. Pipe
5. Planer
6. Shaper
WELDING OUTFIT
1. Acetylene
2. Electric

Metalworking — Small Tools

ARBORS
1. Drill chuck to suit requirements
2. Reamers, various sizes
3. Shell tool, various sizes
4. Straight shank for shell reamers and shell drills, selected sizes
5. Taper shank for shell reamers and shell drills, selected sizes
BEARING SCRAPER
BELLOWS — for foundry class
BEVEL PROTRACTOR
BROOMS AND FLOOR BRUSHES — for shop and foundry
BRUSHES
1. Bench
2. Core box
3. Core painting
4. Hard brushes for foundry
5. Floor
6. Soft brushes for foundry
BULB SPONGES — for molders
CAKE FORKS — for foundry
CALIPERS
1. Hermaphrodite, 4 in. and 6 in.
2. Inside, 4 in. and 6 in.
3. Outside, 4 in. and 6 in.
CANS
1. Oil, ⅓ pt., 1 pt., and 10 gal.
2. Waste
CENTER TESTERS
CHISELS
1. Cape, 3/8 and 5/8 in.
2. Cold, 5/8 and ¾ in.
3. Diamond point, 3/8 and ½ in.
4. Roundnose, 3/8 and ½ in.
CLAMPS
1. 4, 6, 8, and 10 in.
2. Flask, for foundry
3. Strap, various sizes
COLLETS
1. For milling machine, selected sizes
2. For lathe, selected sizes
COMBINATION SQUARES — with hardened head and blade, and protractor head, 9 and 12 in.
COUNTERBORES — straight and tapered shanks, selected sizes
COUNTERSINKS — for metal
CRUCIBLE TONGS — to fit crucibles
CRUCIBLES — selected sizes
1. Shanks, single end to fit ladles
2. Shanks, hand, to fit ladles
CUTTERS — angular milling, bevel gear, concave milling, convex milling, end milling, face milling, formed milling, grooving, involute gear teeth, key seat, side milling, and metal splitting
DIVIDERS — spring, 4 and 6 in.
DRAW PINS — for molders
DRILLS
1. Drifts, different sizes
2. Sleeves, different sizes
3. Stand for Nos. 1 to 60
4. Stand for 1/16 to ½ in. by 64ths
DRILLS
1. Center
2. High speed, taper shank, various sizes
3. Jobbers, straight shank, 1/16 to ½ in. by 64ths
4. Ratchet
5. Straight shank, Nos. 1 to 60
6. Taper shank, ½ to 1 in. by 16ths
FILE CARDS
FILES
1. Die sinkers, various shapes
2. Flat bastard, 8, 10, 12, and 14 in.
3. Half round, double cut, 6, 8, 10, and 12 in.
4. Hand, smooth, 8, 10, and 12 in.
5. Mill, smooth, 8, 10, and 12 in.
6. Round bastard, 8 and 10 in.
7. Square bastard, 8 and 10 in.
8. Swiss, various shapes
9. Three-square, double cut, 6 in.
10. Warding, double cut, 6 in.
FIRST-AID CABINET AND SUPPLIES
FORGE TOOLS — drift pins, flatters, fullers hand and handle punches, hardies, hot and cold cutters, set hammers, and swages for the forge shop
GATE STICKS — maple for foundry
GAUGES
1. Center
2. Depth
3. Drill and wire
4. Screw pitch, select kinds

(Continued on next page)

(Continued from previous page)

5. Surface
6. Thickness

GLOVES — asbestos, for foundry

GOGGLES
1. For machine shop 2. For foundry

HACK SAW
1. Blades, hand, 18T, 10 in.
2. Blades, power, 14T, 12 in.
3. Frames, adjustable

HAMMERS
1. Babbitt
2. Ball peen, 13, 16, or 20 oz.
3. Blacksmith's, various kinds
4. Riveting, 9 and 12 oz.
5. Setting

INDICATOR
1. Center
2. Universal or universal dial test
3. Speed

KNURLING TOOL — with assorted knurls

LADLES
1. Bull 2. Hand bowls 3. Melting

LATHE DOGS — ½, ¾, 1, 1½, 2, 2½, and 3 in.

LEGGINGS — fireproofed duck, to protect students when pouring in foundry

LEVEL — 6-in. bench

LIFTING SCREWS — for molders

MALLETS — wood or soft

MANDRELS — selected sizes

MICROMETERS — inside, 1½ to 8 in.; outside, 0 to 1 in.; outside, 1 to 2 in.; outside, 2 to 3 in.

MOLDING BOARDS

MOLDING STICKS AND TROWELS — various kinds

NIPPERS — end cutting, 5 in.

OIL STORAGE TANK — with pump

OILSTONES — medium and fine

PAILS — galvanized, 12-qt. capacity for foundry

PARALLELS
1. Adjustable 2. Steel, assorted sizes

PLIERS
1. Combination, 6 in.
2. Side-cutting, 6 in.

PUNCHES
1. Center, ¼ and ⅜ in.
2. Hollow, ½, ¾, and 1 in.
3. Pin, ⅛, 5/32, 3/16, 7/32, and ¼ in.
4. Prick, ¼ in.

RAMMERS — for foundry
1. Hand 2. Floor
3. Taper pin 4. With taper shank

REAMERS — various sizes
1. Adjustable
2. Hand

RIDDLES — ¼- and ⅛-in. mesh, 18-in. diameter, for foundry

RIVET SETS — assorted sizes

SCALES
1. Steel, 6 in., graduated 1/64 to ⅛ in.
2. Steel, 12 in., graduated to 32nds

SCREW DRIVER — 6 and 9 in. blade

SCRIBERS

SHOVELS
1. Coke 2. Sand

SNIPS — tin, 3 in. straight and 3 in. curved

SOCKETS — for taper shanks, drills and tools, selected sizes

SOLDERING COPPERS AND HANDLES — 1-lb. size

SPRAY CAN — for molders

SPRINKLING CANS — galvanized iron, 16-qt. capacity, for foundry

SPRUE PICKS — for molders

SQUARES
1. Machinist's, 6 in. 2. Blacksmith's

STEEL FIGURES — ⅛ in.

STEEL LETTERS — ⅛ in.

SWABS — for molders

TAPELINE — steel, 25 ft.

TAPS AND DIES
1. Machine screws 3. N.F. ¼ to ¾ in.
2. Pipe 4. N.C. ¼ to ¾ in.

TONGS
1. Blacksmith's, various kinds
2. Pick up, for foundry
3. Shake out, for foundry

TOOL HOLDERS
1. Boring tools
2. Cutting-off tools
3. Planer
4. R.H. and L.H. offset shank
5. Shaper 7. Straight shank
6. Slotter 8. Threading

TOOL HOLDER BITS — square, ¼, 5/16, ⅜, 7/16, and ½ in.

TRAMMEL POINTS

V BLOCKS AND CLAMPS

WHEEL DRESSER

WRENCHES
1. Adjustable, 8 and 10 in.
2. Pipe, 8 and 12 in.
3. Tape, adjustable, various sizes

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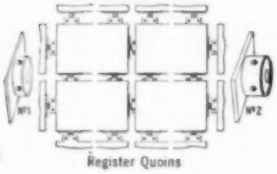
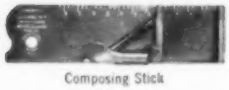
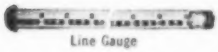

Register Quoins

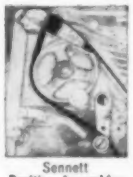
Hand Miterer

Economy Vertical Miterer


Composing Stick

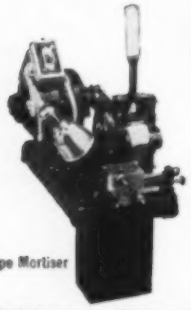
Make-Up Rule


Line Gauge


Sennett Positive Assembler

Newspaper Wall File

Lino Slug Cutter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BELT DRESSING

BELT LACING MATERIAL

BELT LEATHER

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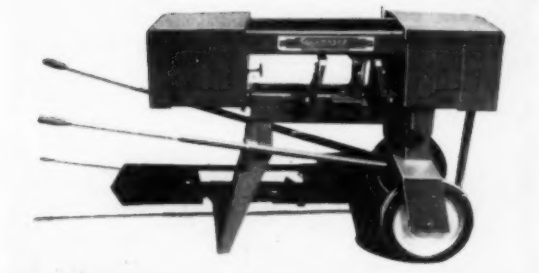
2. Lag, selected sizes
3. Machine, selected sizes
4. N.F., selected sizes
5. Stove, flat or roundheads, selected sizes

BRASS
1. Bars, 3/32, 1/16, 3/16, and ⅛ in. thick; ¼

(Continued on page 48A)

TAKE IT TO THE JOB...

KALAMOBILE —a metal-cutting band saw that's truly portable—handier than ever!



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(Continued from page 46A)

to 1 in. wide, 8 to 10 ft. long, selected sizes
2. Round rods, 3/16 to ½ in. by 16ths, selected sizes
3. Sheets, 28 to 32 American gauge, 12 in. wide by 72 to 84 in. long, selected sizes
4. Strips, 1/32 and 3/16 in. thick, ½ to 1½ in. wide, 50 ft. to a coil, selected sizes
5. Threaded rods, Nos. 6 to 10, in 24 in. lengths, Nos. 12, 14, ¼, and 5/16 in., in 24 in. lengths, selected sizes
6. Wire, soft, 8, 11, and 14 American gauge, selected sizes
7. Wire, spring, 8 to 22 American gauge, selected sizes

CASEHARDENING COMPOUNDS
CHAPLETS — single and double head
COAL
1. Charcoal for foundry or forge
2. Coke for foundry
3. Forge

COPPER
1. Pigs, for casting alloys
2. Sheets, 8 to 25 American gauge, 30 by 60 in., selected sizes
3. Tubing, outside diameters, 3/16, ¼, 5/16, ⅜, and ½ in.; thickness of wall, 1/32 in.; lengths, 8 to 12 ft., selected sizes
4. Wire, soft, 2 to 20 American gauge, in coils. Also in ¼, ½, and 1 lb. spools, sizes 16 to 36, English gauge, selected sizes

CORE
1. Compounds
2. Flour
3. Paste
4. Oil
5. Wax-vent wire

CUTTING COMPOUNDS
FIREBRICKS AND CLAY — for foundry
FIRE HANDLES — assorted sizes
GRAPHITE — for foundry
IRON — pig, for foundry
LACQUER — transparent and colored, for finishing
NUTS — S.A.A., acorn cap, castellated, square, hexagon, joint, and wing, selected sizes and kinds
OIL
1. Boiled linseed
2. Lubricating
3. Quenching and hardening

PACKING
Round, sheet, square, or tubular
PAINT — black asphaltum
PINS
1. Cotter, 3/32 to ¼-in. diam. from ½ to 2 in. long
2. Flask, for flask repairs
3. Taper, Nos. 0 to 6, ¾ to 2 in. long

PUMICE POWDER
RIVETS
1. Copper, with burrs, Nos. 7 to 14, lengths, ⅜ to ¾ in., selected sizes
2. Iron, No. 14 gauge to 3/16 in., flathead or button head, ¼ to 1 in. long, selected sizes
3. Tinners', flathead, 8 oz. to 16 lb., either tinned or black, selected sizes

SAND
1. Molding in 350-lb. barrels or 800-lb. casks
2. Parting, in 350-lb. barrels or 800-lb. casks

SCREWS
1. F.H. or R.H. iron or brass, selected sizes and kinds
2. Cap and machine, iron or brass, selected sizes and kinds
3. Set, head and headless

SOLDER — acid or rosin core; bar, or solid wire
SOLDERING PASTE OR SALTS
STEEL
1. Bessemer, rod, 1/64 to 3/8 in. by 64ths, in 4-ft. lengths, selected sizes
2. Bars, cold rolled, ⅛ to ¾ in. thick, ½ to 2 in. wide, 12-ft. lengths, selected sizes
3. Drill rod, letter sizes, A to Z, number sizes, 1 to 80, in 3-ft. lengths, selected sizes

(Continued on page 50A)

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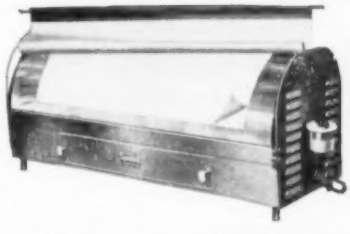

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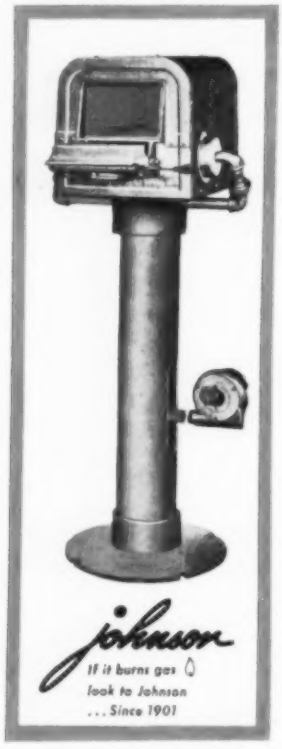

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585 E Avenue N.W., Cedar Rapids, Iowa

(Continued from page 48A)

4. Rods, hexagon and square, cold rolled, ¼ to ¾ in., in 12-ft. lengths, selected sizes
5. Round, cold rolled, diameters ⅛ to 1 in., lengths 12 ft., selected sizes
6. Sheet, black, Nos. 18, 20, 22, 24, 26, 28, U. S. gauge; size of sheets, 24, 28, and 30 in. by 96 in.
7. Sheet, galvanized, Nos. 18, 20, 22, 24, 26, 27, and 28, U. S. gauge; size of sheets, 24, 28, and 30 in. by 96 in., selected sizes
8. Threaded rods, Nos. 6 to 10, in 12-in. lengths, Nos. 12, 14, ¼ in., and 5/16 in., in 24-in. lengths, selected sizes

TIN
1. Pigs, for casting alloys
2. 1C, 1X, 20 by 48 in.
3. 1XX, 20 by 48 in.

WASHERS AND BURRS
1. Copper burrs, Nos. 3 to 14, in 1-lb. boxes
2. Iron burrs, Nos. 3 to 14 in 1-lb. boxes
3. Brass washers, 3/16 to ½ in. by 16ths
4. Iron washers, 3/16 to ½ in. by 16ths

WELDING FLUXES

WELDING RODS (all rods come in 24-in. lengths)
1. Brazing, 3/16, ⅛, 3/16-in. diameter.
2. Cast aluminum 3/16, ¼, and 3/8-in. diameter
3. Cast brass, 3/16 and 3/8-in. diameter
4. Cast bronze, ¼-in. diameter.
5. Cast copper, 3/16 and ¼-in. diameter
6. Cast iron, 3/16, ¼, 5/16, and 3/8-in. diameter
7. Low carbon steel, ⅛, 3/16, and ¼-in. diameter

WHITE LEAD — for machine shop

WIRE
1. Annealed, 16 to 34 W and M gauge, selected sizes
2. Coppered market, 5 to 18 W and M gauge, selected sizes
3. Coppered spring, 2 to 18 W and M gauge, selected sizes
4. Galvanized, 5 to 18 W and M gauge, selected sizes
5. Piano, Nos. 2/0 to 36, selected sizes
6. Tinned, 16 to 24 W and M gauge, selected sizes
7. Wool, Nos. 0 to 3 in 1-lb. packages, selected sizes

ZINC
1. Pigs, for casting alloys
2. Sheet, Nos. 4 to 14, sheets 36 by 84 in.

NEW PUBLICATIONS

(Continued from page 44A)

Refrigeration, Air Conditioning, and Cold Storage

By Raymond C. Gunther. Cloth, 1232 pp., 6½ by 9½ in., illus., $17.50. Chilton Book Division, Philadelphia, Pa.

This voluminous text presents a clear picture of the principles of refrigeration. All calculations have been reduced to arithmetic except where decimal exponents require logarithmic treatment.

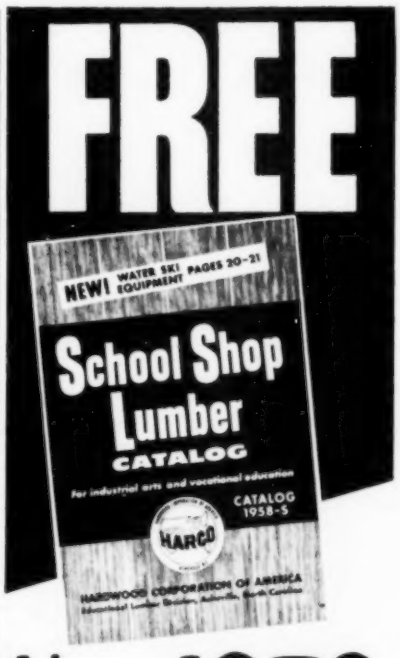
The book contains numerous tables and sample problems that have been worked out to clarify the method for the student.

The three phases of refrigeration are thoroughly covered — development, production, and application.

Development presents the study of how to operate and maintain the refrigerating system.

Production embraces the study of the refrigeration cycle as well as the physical, chemical, and thermodynamic properties of refrigerants, and application discusses the processes required to extract heat by mechanical means.

(Continued on page 56A)



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#75 GENERAL LEATHERCRAFT

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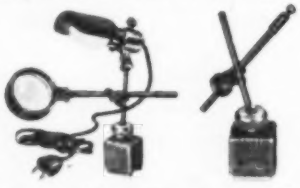
holds small tools firmly almost anywhere, without clamping



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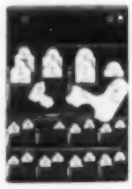

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CUTTERS • MACHINE TOOL ACCESSORIES • GEAR, VANE AND CENTRIFUGAL PUMPS

AUTOMOTIVE EQUIPMENT

(Continued from page 42A)

CALIPERS
1. 6" — inside spring nut release, screw thread adjustment. High grade spring steel
2. 6" — O.D. spring nut release, screw thread adjustment. High grade spring steel

CARBURETOR TOOL KIT
Complete set of overhaul tools for popular makes of carburetors

CHISELS
1. Cape 1/4" — 6" length forged tool steel
2. Cold 1/2" — 6" length forged tool steel
3. Diamond point 1/4" — 6" length forged tool steel

DIES (for economy, purchase taps and die in sets)
1. Machine screw — 6-32NC, 6-40 NF, 8-32NC, 8-36NF, 10-24NC, 10-32NF, 12-24NC, 12-28NF
2. National standard — adjustable round split dies forming American standard thread 7/16" thickness, 1 5/16" outside dia. high quality alloy: 1/4"-20NC, 5/16"-18NC, 3/8"-16NC, 7/16"-14NC, 1/2"-13NC, 9/16"-12NC, 5/8"-11NC, 3/4"-10NC, 1/4"-28NF, 5/16"-24NF, 3/8"-24NF, 7/16"-20NF, 1/2"-20NF, 9/16"-18NF, 5/8"-18NF, 3/4"-16NF
3. Die stock machine screw — to hold 13/16" O.D. round adjustable machine screw die
4. Die stock, national standard — to hold 7/16" thick, 1 5/16" O.D. national standard die

DIVIDERS
6" stiff spring tapered spool, high quality spring steel legs with replaceable needle-points

DRILL STAND — fractional 1/16" to 1/2"

DRILL, ELECTRIC (*see* Special Equipment Section)

FILE CARD
Steel back frame and face. Tempered steel wire bristles, complete with steel tapered pick

FLARING TOOL
3/16" to 5/8" O.D. tubing size

GAUGES
1. Shoe and drum gauge — leaf type shim gauge for testing brake shoe and drum clearances
2. Tire gauge, standard tire pressure gauge, 0-60 lb. capacity
3. Screw pitch gauge, 60°V type thread, 22 pitches, 32 to 74
4. Thickness gauge, 2 3/16" length blade, 22 blades .004" to .025" tempered and encased
5. Thickness gauge, 6" blade, 8 tapered leaves, .002, .003, .004, .006, .008, .010, .012, and .015 leaves

HAMMERS
1. Machinist — 12 oz. ball peen, forged steel, heat treated and polished, wooden handle
2. Machinist — 24 oz. ball peen, forged steel, heat treated, wooden handle
3. Claw hammer, adze eye, curved claw, bell shaped head. Wooden handle, forged head
4. Sledge — 7 lb. bell face, adze eye, forged hardened and tempered steel. Wooden handle
5. Soft faced head, wooden handle

KNIFE, PUTTY
1 1/4" wide 3 1/2" long, tempered polished elastic steel

MICROMETERS
1. Inside diameter — calibrated to .001", range 2"-9 1/2", calibrated thimble with ground steel extension rods. Angular grooved extensions for quick adjustment
2. Outside diameter — drop forged "I" section frame. Anvil, spindle, and barrel

high quality, ground steel. Standard calibrations. Size 0–1", 1–2", 2–3", 3–4" (4 sizes)

OILER
5 oz., 3" spout, steel can, tempered steel bottom

OIL STONE
4" x 1¾" x ½" medium, complete in wooden case

OIL MEASURE
2 qt. heavy gauge galvanized steel combination measure, funnel and spout. All seams soldered

PISTON RING INSERTER SET
Spring steel strap type with a "T" handle adjusting device

PLIERS
1. 5" — flat nose, cross-checked, spring tempered nose, forged tool steel
2. 7" — long tapered flat nose, cap joint forged, tempered crestalog steel or equal
3. 8" — combination slip joint, forged tool steel
4. 7" — diagonal cutter mechanic's pliers, forged heat treated high grade tool steel

PUNCHES
1. Drive pin, 8" knurled hardened steel, set of 8: 1/16" dia. to 5/16" dia.
2. Center, ¼" x 4", forged alloy steel hammer tested, knurled handle

RIVET SET
Hand type for button head rivets

RULE, STEEL
12" x 1" width stainless steel, tempered, graduated in 1/8", 1/16", 1/32", 1/64"

SAW, HAND HACK
8" — 12" adjustable frame, 2¾" throat, pistol grip

SCREW DRIVERS
1. 3" — carbon steel blade, wooden handle pinned to blade
2. 6" — carbon steel blade, 5/16" dia. wooden handle pinned to blade
3. 9½" — square drop forged steel blade, perfect handle grip riveted to blade
4. 6" — carbon steel blade, 3/16" dia. tough plastic molded handle
5. Offset at both ends, forged and tempered tool steel, set of 6 for 3/16" to ¾"
6. Phillips head screw driver, alloy steel tempered deep fluted blade. Set of 4 to fit points Nos. 1, 2, 3, and 4
7. Clutch head screw driver, alloy steel tempered. Set of 4, Nos. 1, 2, 3, and 4

SCREW EXTRACTOR
Straight shank, deep fluted blade, hardened tool steel, set of six

SCRIBER
1/8" dia. 10" double point hardened tool steel

SNIPS, TIN
1. Straight — 3" drop-forged hardened tool steel, straight blade ground and polished
2. Curved — 3" drop-forged, hardened tool steel

SOLDERING IRON, ELECTRIC
5/8" electric soldering copper, 200 watt complete with cord, tip and stand

SQUARE, COMBINATION
Tempered 12" blade with forged square, center, protractor heads

STAMPS, STEEL
1. 3/16" hand cut figures 1 to 0
2. 3/16" hand cut letters A to Z

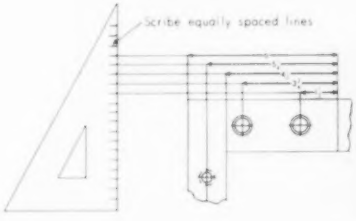
TAPS (for economy purchase taps and dies in sets)
1. Machine screw taps — hand tap, plug type, straight fluted, high quality, carbon steel fine ground thread; 1-set: 6–32NC, 6–40NF, 8–32NC, 8–36NF, 10–24NC, 10–32NF, 12–24NC, 12–28NF

(Continued on page 56A)

DRAFTING TIPS

Drawing equally spaced dimension lines

Dimension lines can be equally spaced by scribing a triangle along any vertical side with equally spaced marks. Starting at the base dimension line, vertical witness lines are drawn to each succeeding mark up the scale. This leaves the ends of the witness lines spaced at equal intervals. Horizontal dimension lines are then drawn in by eye from the end of the witness lines, resulting in equally spaced dimension lines.



Important facts on drawing board construction

Through the years many types of woods and production techniques have been used in drawing board construction. These years of manufacture and research have shown that one wood, Basswood, has proved itself superior for use as drawing board stock. Basswood provides the necessary firmness, color, resiliency,

and dimensional stability needed to produce a sturdy, top quality product. Basswood is also economical enough to be well within a school's budgetary requirements. Because of these features POST uses choice stocks of Basswood in all its regular and metal edged drawing boards.

Electronic bonding of the Basswood strips provides stability and greater strength. The Basswood end cleats are joined by tongue-and-groove method and glue bonded for greater resistance to warpage. These advanced methods used in POST's own woodworking facilities permit the production of quality drawing boards for every purpose in every price range.

POST'S own specialized woodworking facilities

A complete line of fine products for drafting and engineering students is made at the POST plant in Owen, Wisconsin. This includes drawing boards, T-squares, scales, precision triangles, curves and many others. Great care is taken to meet POST's rigorous quality standards on each item produced.

For complete information on POST *drawing boards and other products, write the Educational Sales Division, Frederick Post Company, 3648 North Avondale Ave., Chicago 18, Illinois.*

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Drafting — Small Equipment and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films and silent or sound movies may be used by the students in the industrial arts and vocational education courses.

ADJUSTABLE-CURVE RULER
BEAM COMPASS
BENCH BRUSHES
BLUEPRINT
1. Frame or machine
2. Washing trays or washer
3. Paper tube, airtight
4. Drying rack or dryer
BOOKCASE
CABINET
1. For filing drawings
2. For storing drawing boards
3. For storing drawing instruments
4. For storing models
CALIPERS — 6 and 8 in., inside and outside
CHAIR — teacher's
CHALKBOARD
1. Permanent or portable
2. Compass, 15 in., with locking device
3. Drawing set, T-square, straightedge, triangle, and protractor
DESK — teacher's
DIVIDERS — proportional
DRAFTING MACHINE — and accessories
DRAFTSMAN'S STEEL PROTRACTOR
DRAWING BOARDS — large
DRAWING-BOARD SUPPORTS — to be set on or attached to woodworker's bench
DRAWING TABLES AND STOOLS
1. For students
2. For teachers
INK-BOTTLE HOLDER
IRREGULAR CURVES — Nos. 17, 21, and 24, wood, or transparent
LETTERING ANGLES
LETTERING PENS — assortment of 12
LEVEL OR TRANSIT — builders' for architectural students
LEVELING ROD — for use with the transit
MACHINISTS' COMBINATION SET — 12 in.
MARKING PINS — for use with measuring tape, for architectural students
MICROMETER — 1 in., for mechanical-drafting students
OILSTONE — 3-in. case
PANTOGRAPH — 21 in.
PARALLEL RULES
PLANIMETER
PLUMB BOB
SHEARS — for trimming blueprints and drawings
SPEED COUNTER — for mechanical-drafting students
STEEL SCALES — 12 in.
STOP WATCH — for mechanical-drafting students
TABLE
1. For cutting and trimming drawings and blueprints
2. For disassembling and re-assembling machine parts and models
TAPELINE
1. 100 ft., steel, for architectural students
2. 50 ft., steel or metallic
TOOLBOX — containing 1 machinists' hammer, one 6-in. adjustable wrench, one 6-in. screw driver, one 6-in. combination pliers
TRIANGLES
1. 30-60 deg., 14 in. transparent
2. 45 deg., 10 in. transparent
TRIANGULAR SCALES — civil engineers' type, 12 in.
T SQUARE — adjustable or fixed head, for large drawing board or straightedge with parallel rule attachment for large drawing board
WALL CHARTS — lettering, decimal equivalents, etc.
YARDSTICK
To be provided by, or for, each student

Drafting Supplies

DRAWING BOARD — size to be specified by instructor
DRAWING INSTRUMENTS — as specified by instructor
ERASING SHIELD
IRREGULAR CURVE — Nos. 8 and 13, transparent
PENCIL COMPASS
PENHOLDER — for lettering pens
PENS — assorted, for lettering
PROTRACTOR — not over 5 in.
SCALE — 12 in. architect's, triangular
SCALE GUARD
SLIDE RULE — as specified by instructor
T SQUARE — to fit drawing board
TRIANGLES — 30-60 deg., 10 in. transparent, and 45 deg., 8 in. transparent

Drafting Equipment

BICHROMATE OF POTASH — crystals
BLUEPRINT
1. Paper, 36 in. wide
2. Writing fluid
PAPER
1. Cross section, 8½ by 11 in.
2. Detail, 24 by 36 in.
3. Drawing, 24 by 36 in.
4. Isometric, 7 by 10 in.
5. Tracing, 36 in.
POWDER — for tracing cloth
TRACING CLOTH — 36 in.
VAN DYKE
1. Fixing salts
2. Paper, 36 in.
3. Writing fluid

Drafting — Additional Supplies

To be provided by, or for, each student.
ERASERS
1. Cleaning
2. Ink
3. Pencil
INK
1. Black, waterproof
2. Colored, if required
PENCILS — DRAWING, HB, 2H, 3H, 4H, and 6H
PENCIL POINTER PAD
THUMBTACKS OR SCOTCH TAPE

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T SQUARES	LETTERING SETS
TRIANGLES	GRAPH PAPER
CURVES	SLIDE RULES
PROTRACTORS	MEASURING TAPE

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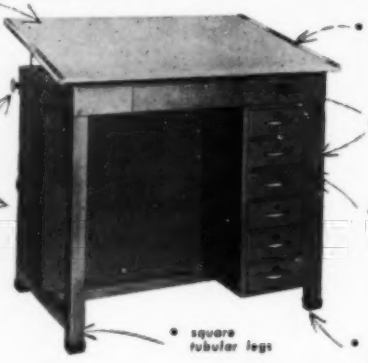
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drawers operate smoothly on nylon glides
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AUTOMOTIVE EQUIPMENT

(Continued from page 55A)

2. N.C. Standard — hand tap plug type, national course standard thread, high quality carbon heat treated steel, 1-set: ¼"–20, 5/16"–18, ⅜"–16, 7/16"–14, ½"–13, 9/16"–12
3. National fine standard, hand tap, plug type high quality carbon heat treated steel, 1-set: ¼"–28, 5/16"–24, ⅜"–24, 7/16"–20, ½"–20, 9/16"–18, ⅝"–18, ¾"–16
4. National Standard Pipe, ⅛", ¼", ⅜"

TAP WRENCH

1. T-handle, single handle, adjustable chuck, hardened jaws, made of quality steel
2. Machine screw tap wrench, T-handle adjustable vise jaw, for holding machine screw tap size 6–32 to 12–28, quality steel
3. National Standard tap wrench, adjustable vise jaw, for holding tap sizes ¼" to ¾", high quality steel

WRENCH, ADJUSTABLE

6" — single and adjustable jaw, forged steel, replaceable parts

WRENCH, MONKEY

10" length, 2" capacity, forged jaws and handle with nonmetallic fitted handle

WRENCH, PIPE

10" — length, ⅛" to 1" pipe capacity, forged and hardened tool steel

WRENCH, SPANNER

Adjustable hook drop forged carbon steel hardened and finished smooth. Set of 3, capacity ¾" to 4¾" diameter

It is recommended that only high quality alloy steel wrenches and sockets be purchased. Specifically, they should have lifetime guarantees so that cracked sockets and sprung wrenches can be replaced free of charge

WRENCHES, BOX

Double broached hex, double offset drop forged chrome-moly alloy steel. Lifetime guarantee and replaceable. 4 to 8 sets: 4½" to 6" (short length), 3/16" and ¼", ¼" and 5/16", 5/16" and ⅜", ⅜" and 7/16", 8" to 19" (long length), ¼" and 5/16", 5/16" and ⅜", 7/16" and ½", 9/16" and 5/8", 5/8" and 11/16", ¾" and ⅞", 13/16" and 1"

(Continued on page 59A)

NEW PUBLICATIONS

(Continued from page 50A)

Receiving Aerial Systems

By I. A. Davidson. Cloth, 152 pp., 4⅞ by 7½ in., illus., $4.75. Philosophical Library, Inc., New York, N. Y.

In this book the author describes how to design, construct, and install aerials for the reception of broadcasting and television.

In the 12 chapters of the book, the author discusses the subject under the following headings: fundamental concepts, aerials for broadcast reception, directional characteristics of aerials, aerials for single-channel reception, combined aerials, choice of aerials, radio-frequency cables and accessories, mechanical design of aerials, and measurement of aerial characteristics.

Several mathematical considerations arising in aerial design are covered in appendix 1, 2, and 3.

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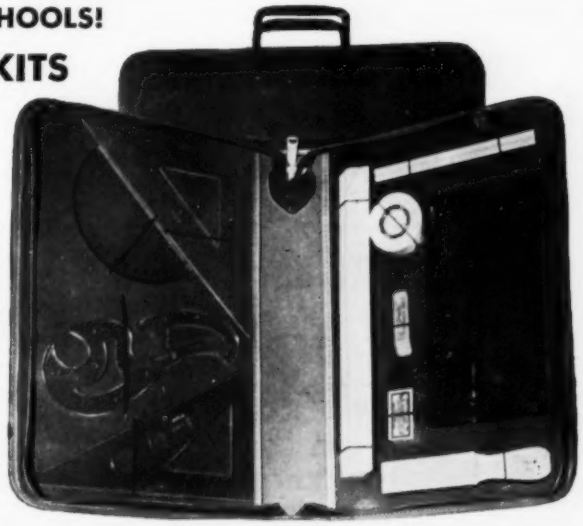

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Architect's Scale	Pencil Pointer
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10" Triangle (30°-60°)	2 Erasers

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12" Triangular Scale	Pencil Pointer
6" Triangle (45°-90°)	Drawing Pencil
8" Triangle (30°-60°)	2 Erasers

In handy 10" x 14" zipper carrying case of Texon. Two inner compartments for note papers. Opens to 14" x 20".

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ALVIN & CO., INC. Windsor, Connecticut

MAIL THIS COUPON TODAY!

Alvin & Co., Inc.
Windsor, Connecticut

Please send me the FREE 1958 Alvin Ready Reference Chart.

Name _____

Address _____

City _____ Zone ____ State _____

VEMCO drafting machines give vocational students "on-the-job" experience

Vocational education departments, equipped with VEMCO professional size drafting machines, are training students with the same type of drafting equipment industrial employers will expect them to use.

Built for Long Service

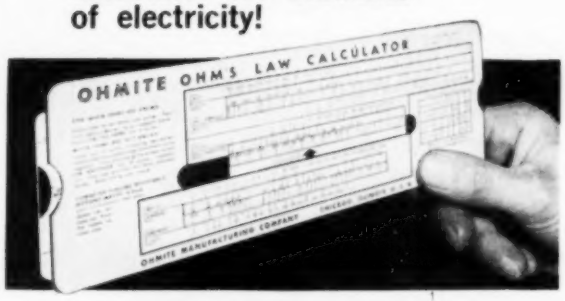
Permanently sealed ball bearings.
Pulleys and housings machined die castings.
Hardened steel, ground index plate.
Steel bands — continuous, no joints.

See your VEMCO dealer, or write:

V. & E. MANUFACTURING CO.
Education Dept. A
P.O. BOX 950-M • PASADENA, CALIFORNIA

VEMCO
Drafting Equipment of Quality

A time-saving calculator for students of electricity!



OHM'S LAW Calculator and Slide Rule

A time-saving calculator for your students after they have learned Ohm's Law. Solves Ohm's Law and many parallel resistance problems simply, quickly, accurately—with only one setting. Slide rule scales multiply, divide, find squares, square roots, etc. Only 9" x 3", heavily varnished cardboard, it fits conveniently into the pocket. Also available in durable vinylite at $1.50.

ONLY
25¢

TEACHERS!
only 15¢ each
in quantities
of 25 or more

OHMITE MANUFACTURING CO. 3656 Howard Street Skokie, Illinois

AUTOMOTIVE EQUIPMENT

(Continued from page 56A)

WRENCHES, ELECTRICAL
Open end, double end, thin chrome-moly forged steel, chrome plated electrical set of 9: $\frac{13}{64}$" to $\frac{9}{16}$" openings

WRENCHES, SOCKET
$\frac{1}{2}$" square drive and/or $\frac{3}{8}$" square drive, thin wall, double broached, chrome alloy heat treated sockets. Chrome plated finish, 4 to 8 sets: $\frac{7}{16}$", $\frac{1}{2}$", $\frac{9}{16}$", $\frac{9}{16}$" extra thin for Ford V-8 85 h.p. connecting rods, $\frac{19}{32}$", $\frac{5}{8}$", $\frac{21}{32}$", $\frac{11}{16}$", $\frac{3}{4}$", $\frac{25}{32}$", $\frac{13}{16}$", $\frac{7}{8}$", $\frac{15}{16}$"

WRENCH, HANDLE
11" — $\frac{1}{2}$" and/or $\frac{3}{8}$" square drive sliding "T" handle, alloy steel, lock-in plug connector

WRENCH, EXTENSION DRIVE
1. 5" — $\frac{1}{2}$" and/or $\frac{3}{8}$" square drive extension, alloy steel, lock-in plug connector
2. 10" — $\frac{1}{2}$" and/or $\frac{3}{8}$" square drive extension, alloy steel, lock-in plug connector

WRENCH, RATCHET (Reversible)
Ratchet gear, $\frac{1}{2}$" and/or $\frac{3}{8}$" square drive, quick reversible. Lock-in plug connector

WRENCH, DRIVE ADAPTER
1. $\frac{3}{8}$" square female and $\frac{1}{2}$" square male
2. $\frac{3}{8}$" square male and $\frac{1}{2}$" square female

WRENCH, TAPPET ADJUSTING
1. $\frac{1}{2}$" — $\frac{9}{16}$" open end, thin alloy steel wrench
2. $\frac{5}{8}$" — $\frac{11}{16}$" open end, thin, alloy steel wrench

WRENCH, UNIVERSAL JOINT
1. $\frac{3}{8}$" and/or $\frac{1}{2}$" sq. drive

Special Equipment and Testing Devices

Most of the special equipment used in the auto shop will last for a long time. Such things as compressors, grinders, welding torches, and creepers will stand up for many years with a minimum of periodic service.

Testing devices are more delicate and, consequently, more expendable. They must be repaired or replaced regularly. . . . It is of vital importance that meters, analyzers and testers be of the type used currently in the industry. The advice of local service people will be of great assistance when considering what types to procure.

AIR COMPRESSOR
1. 5 h.p., 26 cu. ft. min. capacity, max. pressure 150 PSI, complete with steel tank, regulator, pressure unloader, safety valve and piping
2. Air blow gun — forged brass, button valve type, 25 CFM at 100 PSI, specify hose size
3. Air line chuck — ball foot type with serrated shank. Specify hose I.D.

ALIGNING JIGS — for connecting rods

ARBOR PRESS — 25 ton hydraulic

BATTERY EQUIPMENT
1. Batteries, storage — automobile 6 volt, 100 amp. hour capacity; 12V, 50 amp. hr.
2. Battery carrier
3. Battery charger, tube rectifier type, 6 amp. capacity for 12 6-volt or 6 12-volt batteries
4. Battery charger, fast charger selenium rectifier type with charging rate controlled by battery temperature
5. Battery hydrometer with built-in thermometer
6. Battery syringe to water cells
7. Battery voltmeter, high rate discharge O-3V, high capacity resistance unit, prong type

BENCH
1. Electric test — facilities for testing: generators, regulators and starting motors, 3 h.p. min. motor, variable speed drive for approximately 500-6000 r.p.m. tachometer, voltmeter, ammeter, shunts and resistors
2. Work, with vises (4" vise)
3. Work, portable with vise

BRAKE EQUIPMENT
1. Lining grinder with necessary adapters to grind and centralize car brake shoes
2. Drum lathe with necessary attachments for both turning and grinding, including brake cylinder hones, lining clamps, and brake drum micrometer
3. Reliner — combination riveter and grinder
4. Lining bonder and remover (check electrical supply)
5. Brake bleeder

CONTAINERS
1. Can, safety gasoline — 1 gal. 24 ga. lead coated, non-spill sealed. Trigger type pouring lip
2. Can, waste — galvanized 12" x 15" can with legs and spring lift cover

CHAIN HOIST — with overhead trolley and monorail, 3 ton capacity

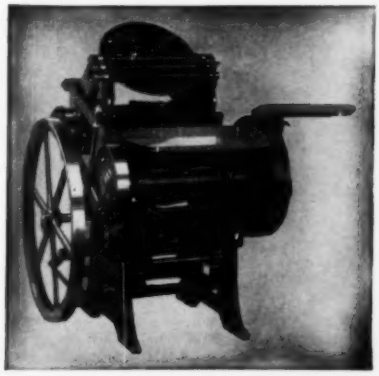
CLEANER
1. Steam — low pressure type (check local code)
2. Ring groove cleaner

CORD EXTENSION LIGHT
Complete with molded rubber handle and socket. 20 feet super-service cable, molded rubber attachment plug and lamp guard

COMPASS — magnetic type needle

(Continued on next page)

C & P NEW SERIES PRESSES These presses in sizes of 8x12, 10x15, 12x18 and 14½x22, provide the student with equipment that furnishes all practical requirements of hand fed press operation. May be equipped with flywheel, belt and platen guards. Also furnished for treadle operation instead of motor drive.



CHANDLER & PRICE
PRESSES and PAPER CUTTERS

C & P BENCH CUTTER An efficient, small size cutter that handles sheets up to 19"x24". Equipped with two-handed safety control.

C & P PILOT PRESS A thoroughly efficient little press, chase 6½x10, that teaches basic principles of press operation with exceptionally fine printing results.

The Standard for Printing Education

C & P presses and paper cutters have been standard equipment in commercial plants and schools for over 50 years. So, the selection of C & P equipment for printing classes places before the students *practical* equipment exactly as used in commercial practice in the entire printing industry.

In addition, special safety features are incorporated, when desired, in C & P presses and paper cutters so that all safety requirements are fully satisfied.

For practical instruction—for safety in use—the foresighted administrator recommends . . . Chandler & Price.

"HANDBOOK OF PLATEN PRESSWORK" *is one of the outstanding aids to printing furnished without charge to printing instructors. If you do not have a copy, just request one.*

THE CHANDLER & PRICE COMPANY
6000 CARNEGIE AVENUE • CLEVELAND 3, OHIO

AUTOMOTIVE EQUIPMENT

(Continued from previous page)

CREEPERS — 4 universal casters attached for easy movement

DEGREASER — with drum, filter and pump type circulated cleaning fluid

DRILL
1. Electric portable, ¼"
2. Electric portable, ½"
3. Press, 21", with motor and chuck

DYNAMOMETER
1. Chassis hydraulic absorption type
2. Engine hydraulic absorption type

ENGINE LIFTING EQUIPMENT — specify engine lift is to fit

ENGINE SUPPORT BARS — specify engine bars are to fit

FENDER COVERS

FURNACES — gas soldering

GAUGES
1. Cylinder gauge — dial indicator, universal type attachments complete in storage container
2. Compression meter, dial face for use in spark-plug chamber

GREASE DISPENSERS (chassis pressure type)

GRINDER
1. Cylinder, with motor and hone
2. Electric bench grinder, 2 six-inch dia. wheels, complete with motor, switch, guards and tool rests

GROWLER — 110 V-60 cycle, for testing generator and starter armatures

HONING MACHINE
Electric motor driven, for piston pins, king pins, etc., capacity to hone holes from ⅛" to 2⅝" inside diameter

HOT PLATE — electric — 110 V-60 cycle

JACKS
1. Floor roller, hydraulic type, 2 ton
2. Hand stationary hydraulic type, 1½ ton

LATHE — Metal bench type, 9" swing, back geared, motor driven

LIFTS
1. Automobile, hydraulic, twin post
2. Automatic transmission, hydraulic lift

MAGNET — permanent bar type ¼" x 1" x 6"

METERS
1. AVR 75 ampere D.C. 6, 12, and 24 volt scales d.c. complete with standard load resistor. Encased in durable portable case with heavy leads and clips attached
2. Meter, ammeter — 30 amp. capacity, encased in shock proof case
3. Meter, voltmeter — 10 volt rating

RADIATOR HYDROMETER — calibrated for alcohol, glycerine and ethylene glycol with built-in thermometer

SPRING TENSION SCALES
1. Brush and point spring tension scale 0–48 oz. spring type draw scale with hooked prong
2. Steering gear checking scale 0–4 lbs. spring type draw scale with steering wheel grip

STANDS
1. Car stand (horse) — 2 ton min. cap.
2. Engine build up stand, supported to swing through 360°, mounted on casters with locking device
3. Rear axle overhaul stand

TESTERS
1. Coil tester to measure continuity, capacity, and resistance. Tester complete with coil heater and circuit interrupter — for hot and cold tests
2. Condenser tester to measure continuity, resistance, and capacity of condensers
3. Distributor tester, portable type complete for static and dynamic tests. For testing point resistance, dwell, mechanispark advance and vacuum advance
4. Motor tester analyzer, facilities for testing battery, starting voltage and current, cylinder compression, intake vacuum, ignition coil, condenser. Complete with tachometer, dwell meter, volt-amp-resistance and combustion tester
5. Power light tester. Synchroscope three lead type for making dynamic ign. timing
6. Spark plug cleaner and tester
7. Head light tester for focusing and adjusting headlight beam
8. Thermometer tester. Fahrenheit scale, glass tube mercury type. Scale 0° to 300° F.

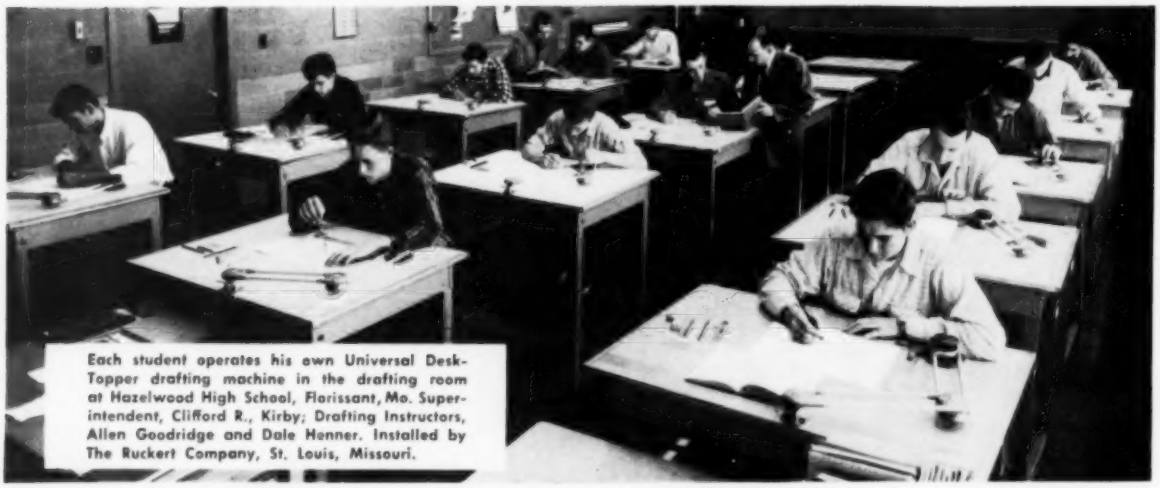
TIRE SERVICE
1. Bead expander to compress crown of tire to force beads of tubeless tire against rim
2. Tire changer with bead breaker and roller
3. Tire gauge
4. Tire tester (water tank)
5. Tire repair kit (Tubeless)

VALVE RECONDITIONING EQUIPMENT
1. Valve refacer, electric. Motor driven grinding wheel. Universal motor driven valve stem chuck, mounted on adjustable feed base. $^{9}/_{16}$" capacity, angle adjustment 30° to 90°, 110 V, 60 cycle motors, bench type
2. Valve seat grinder, complete with stones for popular car sizes
3. Valve spring compressor, adjustable for L head engines
4. Valve spring compressor, adjustable for overhead valve engines

WELDING UNIT
1. Portable oxyacetylene welding unit complete with 2 wheel carrier with cyl-

(Continued on page 62A)

Are you training your drafting students how to operate a drafting machine?



Each student operates his own Universal Desk-Topper drafting machine in the drafting room at Hazelwood High School, Florissant, Mo. Superintendent, Clifford R., Kirby; Drafting Instructors, Allen Goodridge and Dale Henner. Installed by The Ruckert Company, St. Louis, Missouri.

FREE!

Write today for your free copy of technical text material containing all the information you need to properly instruct your students in drafting machine operation. Tells proper use, adjustments and care of the machine. (Please include school name and address.)

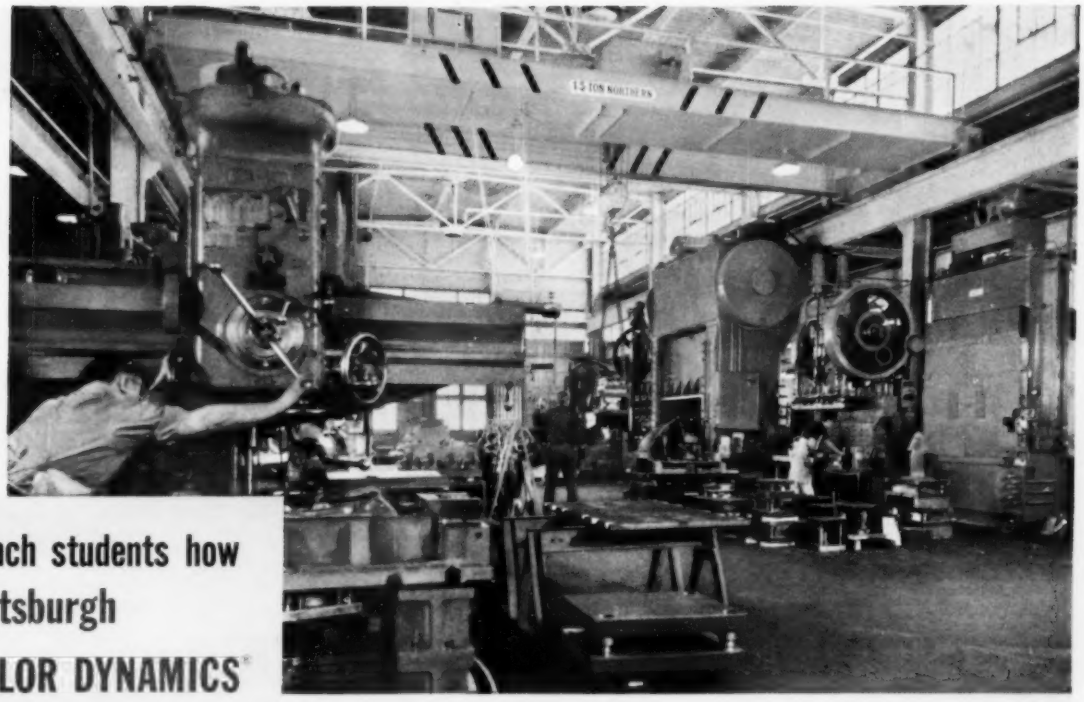
■ Already in urgent demand by industry, school training on drafting machines becomes more vital than ever with the nation's paramount need for science and engineering.

Universal Desk-Topper drafting machines are specially designed and budget priced for school and college use . . . precision-engineered to rigid professional standards . . . widely used in schools throughout the country.

UNIVERSAL DRAFTING MACHINE CORP.

7960 LORAIN AVENUE • CLEVELAND 2, OHIO

Makers of UNIVERSAL BOARDMASTER — the Drafting Machine Preferred by Industry and Science Throughout the World!



Teach students how Pittsburgh COLOR DYNAMICS® improves productive efficiency and safety

Today's vocational schools teach students how to use this modern painting system to reduce eye fatigue, enhance morale and cut down time-loss accidents

In hundreds of schools tomorrow's shopmen are being taught how the principles of Pittsburgh COLOR DYNAMICS improve productive efficiency, enhance morale and cut down time-loss accidents.

● **More and more educators** recognize that knowledge of this modern system of painting will be of great help to students in their future tasks.

● **Practical experience** in many hundreds of plants, such as the Davis Tool & Engineering Company of Detroit, Mich., is demonstrating that COLOR DYNAMICS is making important contributions to improved productivity, better employee-management relations and greater safety.

● **Use of eye-rest colors** on machines and wall areas helps workers to see their jobs better. Eye fatigue, so often the cause of lowered efficiency, is lessened. By the use of focal colors on machines, working parts are separated from stationary parts and the material being fabricated. This reduces eye travel, one of the chief causes of eye fatigue and nervous strain.

● **Use of morale-building colors** in dining and rest rooms improves the worker's mental attitude toward his job and causes him to take pride in his surroundings. This often causes workers to keep their work areas neat and clean, reducing housekeeping problems.

● **Safety colors on controls,** cranes, motorized equipment and traffic lanes warn workers of danger areas, lessening the hazards of accidents.

● **If you wish** to equip your students properly for their future jobs, begin now to teach COLOR DYNAMICS in your school. Better still, demonstrate its principles in practical manner. Apply them in the decoration of your classrooms and equipment. You'll be pleased with the results.

How You Can Get a FREE Color Plan of Your Classrooms

● Write today for a free booklet which explains Pittsburgh's system of COLOR DYNAMICS and how to apply it most advantageously in industry. Better still, we'll be glad to demonstrate its benefits in your classrooms by providing you with a detailed color plan for your study rooms and equipment, without cost or obligation. Call your nearest Pittsburgh Plate Glass Company branch and arrange to have a representative see you. Or mail coupon at right.

Send for a Copy of this FREE Book

Pittsburgh Plate Glass Co., Paint Div., Department IA-38, Pittsburgh 22, Pa.

☐ Please send me a FREE copy of your booklet "COLOR DYNAMICS."

☐ Please have your representative call for a COLOR DYNAMICS survey without obligation on our part.

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PITTSBURGH® PAINTS

SYMBOL OF SERVICE FOR SEVENTY-FIVE YEARS

75th ANNIVERSARY 1883 - 1958

PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED

AUTOMOTIVE EQUIPMENT

(Continued from page 60A)

inder holder device. Including: acetylene regulator, oxygen regulator. Torch complete with tips Nos. 0, 1, 2, 3, 4, 6, 8, 10 and cutting attachment. Oxygen and acetylene hoses of 4 ply molded rubber with clamps. Welding goggles, nonmetalic, molded to fit facila contour, eye cups ventilated, adjustable nose band, No. 6, 50mm. safety lens and 50mm. clear protective lens. Fire extinguisher, trigger type, foamite type. (All equip. must be approved by National Board of Underwriters' Lab.)

WHEEL ALIGNMENT EQUIPMENT

1. Test rack with front pit preferred
2. 3-way alignment gauge set for camber, king pin inclination and caster, including adapter sleeve and clamp to fasten on to spindle. Also turning radius plates
3. Toe-in gauge
4. Wheel balancer. Type capable of testing static and dynamic balance of wheel on car

Special Tools

Special tools for servicing such equipment as automatic transmissions, power steering, and like devices should be requisitioned as required. Give complete purchasing specifications. This applies also to special pullers needed for steering wheels and other special tools.

Automotive Parts and Educational Units

This list of automotive parts should be consulted when developing the teaching devices or educational units which the student will use in preliminary training. His work and experience with these units will be of the laboratory type, in preparation for service work in the automotive service course.

These units must be modern, well maintained, and diversified so that the student can receive experience on all types and designs of similar equipment. An amortization schedule on this material is most important.

BRAKE ASSEMBLY — front and rear
Complete assembly including wheel, brake cylinder, linkage, and foot pedal for basic instructional unit on brakes. (Order mechanical hand, hydraulic, disc, etc., types which are used on current model cars.)

CARBURETORS
Current model carburetors used on popular model automobile engines

CHASSIS, AUTOMOBILE
1. Complete chassis with engine, starter, generator, regulator, and ignition system. All warning and electrical devices attached. (Basic instructional element for electrical work of all kinds.)
2. Chassis instructional element for front and rear suspension units, power transmission units including wheels and tires

DIFFERENTIALS
Complete with carrier, axles, and power drive. Order Hotchkiss drive and torque tube types. For assembly and disassembly

DISTRIBUTORS
Order distributors which are currently used on all popular automobile engines. Complete with distributor head, points, condenser, vacuum advance, automatic advance, and lube fitting (for use as basic training elements)

ENGINES
1. 6-cylinder overhead valve engine complete with clutch and transmission, ignition and fuel systems, in operating condition
2. 6-cylinder in line, L head engine complete with clutch and transmission, ignition and fuel systems, in operating condition
3. 8-cylinder V-type engine complete with clutch, transmission, fuel and ignition systems, in operating condition
4. Any type cut away engine
5. Used engines for assembly purposes. To be mounted for dead engine work

FUEL PUMPS
Order fuel pumps used on current engines. Vacuum, mechanical, magnetic, etc.

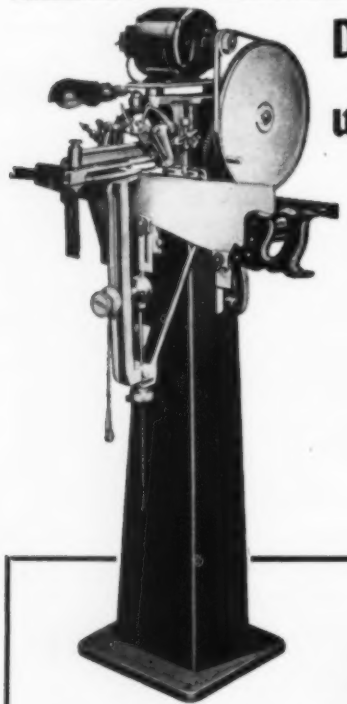
GENERATORS
1. Order d.c. generators used on current model automotive engines complete with pulley and terminals, 6 and 12 volt types
2. Order a.c. high output generator with d.c. rectifier and regulator (used on automotive two-way communication circuits)

IGNITION COILS
Order coils used on current model automobile engines 6 and 12 volt types (for basic training elements)

IGNITION CONDENSERS
Order condensers used on current model automobile engines (for basic training elements)

REGULATORS
Order 2 and 3 unit regulators complete with volt, current, and cutout coils. In good operating condition (for basic training element)

(Continued on page 72A)



Double saw life—train your students better with FOLEY SAW FILING EQUIPMENT

EXCELLENT STUDENT TRAINING
Train your students to use Foley machines. They will do better work with Foley sharpened saws. Foley equipment is safe to operate and is widely used by hundreds of schools, colleges, industries, Army, Navy, Air Force, etc.

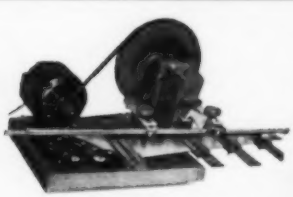
FASTER SAW RECONDITIONING
You can sharpen 4 to 6 hand saws per hour with these three Foley Automatic power machines — Retoother, Saw Filer, Setter.

VOCATIONAL REHABILITATION
Foley Saw Sharpening Machines have proven their value for making physically handicapped persons self-supporting in their own business. Write us for full details.

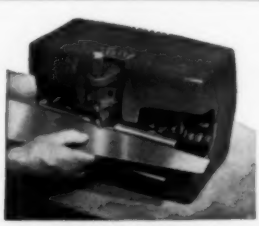
30-DAY FREE TRIAL
Any Foley machine may be installed on 30 day FREE Trial. Write today for detailed information

FOLEY MANUFACTURING CO.
3318 N.E. 5th St. Minneapolis 18, Minn.

FOLEY SAW FILER
Files hand, band and cross-cut circular saws with machine accuracy. The saw is clamped in carrier which feeds it through all 3 machines for retoothing, filing, setting.



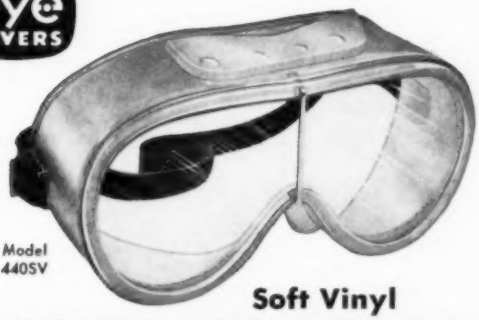
FOLEY RETOOTHER
Cuts new teeth in old saws (either straight or crowned edge) in one run through machine.



FOLEY SETTER
For both hand and band saws. Sets teeth on both sides in ONE run with perfect machine accuracy.

NEW FOLEY GRINDER
Low cost Foley 314 Grinder sharpens circular saws up to 44" diam.; also dado heads, rotary power lawn mower blades, scissors, sharp edged tools. Sands, buffs, polishes.

WATCHEMOKET eye SAVERS



Model 440SV

Soft Vinyl

COVER GOGGLES

FOR 100% EYE PROTECTION

For Heavy Impact. Replaceable, optically correct, methacrylate lenses in choice of clear, green or black frame. Clear Lens is .125" thick; Light and medium green lenses .100" thick; dark green lenses .080" thick.

Stac-Vent Ventilation keeps the goggles fog free. Also available with Regular, Screen Ventilation or No Ventilation.

Soft Vinyl Frame form-fits the contours of the face and nose . . . closes the gaps around nose and cheek . . . more protection . . . more comfort.

Large frame fits over any prescription spectacle . . . easy to adjust . . . comfortable to wear.

WATCHEMOKET eye SAVERS

WRITE FOR FULL INFORMATION

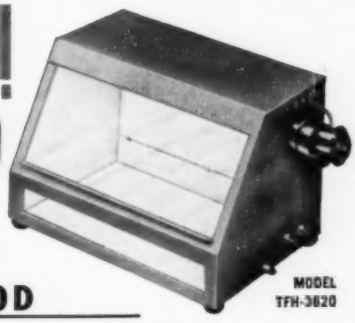
WATCHEMOKET OPTICAL CO., INC.

232 West Exchange St., Providence, R. I.

NEW! TOLCO

• ADVANCE DESIGN
• THRIFTY

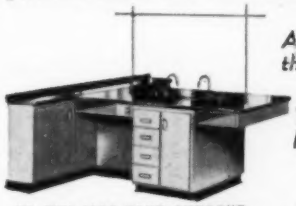
FUME HOOD



MODEL TFH-3620

Built Today for Tomorrow's Laboratory

Compact, flexible, safe and portable, the new Tolco Fume Hood can fulfill all Chemistry and General Science requirements at **LESS COST.** The ultramodern, compact design permits maximum usage with minimum maintenance cost. Finished completely with Grade AA acid resisting, baked-on porcelain enamel over aluminum.



NO. TWL-1260 FOUR STUDENT WALL SCIENCE TABLE

Ask About these other NEW Tolerton Products

NO. TLC-4860 FOUR STUDENT COMBINATION SCIENCE TABLE

THE TOLERTON COMPANY

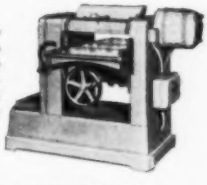
265 N. FREEDOM AVE. • ALLIANCE, OHIO

Easier to Teach–Easier to Learn with

WOODWORKING MACHINES

like these . . .

NO. 4 VARIETY SAW—for variety sawing in any shop! Standard table 44" long and 36" wide, plus 19½" extension for carrying rip gauge table.



NO. 2 SURFACER—new, streamlined machine. Features simplified, mechanical design. Takes material 18" wide and from ⅛" to 8" thick.

HAND JOINTER—compact and accessible. Built in 8" and 12" width. Table 6'2" long, maximum rabbet depth 9/16". Round, 3 knife safety type cylinder head, 3 HP 3600 RPM motor.

SHAPER—1" diameter spindle, with 4½" vertical adjustment, 36" x 26" table, spindle speed–8,500 RPM, floor space—34" x 37". →

BAND SAWS—machine 20" diameter wheel illustrated. Floor space 24" x 36", horizontal capacity 20", vertical capacity under guide 11". Also 27", 32", and 36" machines available.

Write for Catalog

Northfield

FOUNDRY & MACHINE CO.
NORTHFIELD, MINN., U.S.A.

Catalog

CONNECTICUT

Model U322

Only $165.00

UNIVERSAL BENCH BRAKE

for school shops

A quality tool accurate and easy to operate. Versatility makes it ideal for training. Popular in commercial sheet metal shops for light production, box and pan work. Replaceable bronze bushings provide long machine life. Available in 3 and 4 ft. models, universal or plain. Write for Bulletin U 322I.

Rated Capacity: 3/16 flange on 22 gage mild steel, full brake length. Fingers of case hardened steel in widths of 2, 3 and 4 inches permit 3 inch box and pan depth. Other Prices of the Bench Series

4 ft. Universal,	$220.00
3 ft. Plain,	114.50
4 ft. Plain,	134.50

All prices F.O.B. Old Saybrook, Conn.

W. WHITNEY STUECK, INC.
Old Saybrook, Conn.

Print-Shop Equipment

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films, and silent and sound movies may be used by the students in the industrial arts and vocational education courses.

BELLOWS
1. Hand, small size
2. Electric, blower type

BOOKCASE — for reference books, catalogs, etc., sectional preferable

BRAYER — 6 or 8 in. for proofing

BRUSHES
1. Bench
2. Benzine, No. 1, oval black
3. Floor
4. Padding, 1½ in. wide

BULLETIN BOARD

CABINETS
1. Galley, for double column, wood or steel, four tiers (to be used with typesetting machines)
2. Galley, for 8¾ by 13 in. galleys, wood or steel, four tiers
3. Ink and roller, to accommodate platen-press rollers, wood or steel
4. Matrix, for use with typesetting machines only
5. Roller, cabinet or rack for cylinder rollers
6. Supply, for leads, slugs, spaces, strip material, with top for lead cutter and mitering machine
7. Type, school type, each to accommodate two California cases, job cases, case slides, galley slide, and copy holder
8. Type, complete with 24 full-size California job cases, with overhead lead-and-slug cases, wood
9. Type, complete with 24 full-size California job cases, double work bank, wood or steel
10. Wood or metal, for filing class records, instruction sheets, etc.
11. Storage for cuts

CANS
1. Benzine, pint size
2. Benzine, 5-gal. size
3. Kerosene, safety, 1-gal. size
4. Waste can, fireproof, for rags

CASES
1. Blank, full-size, to accommodate ¼-size cases
2. Border, ¼-size, for ornamental borders
3. Lead and slug, regular size, to hold laborsaving fonts of leads and slugs
4. Metal furniture, to hold labor-saving fonts
5. Rule, ¼ size, for brass rule

CHAIRS — teacher's and tablet arm

CHALKBOARD — permanent or portable

CHASE RACKS
1. For platen presses
2. For cylinder presses

CHASES
1. For each size of platen press
2. For cylinder press

COMPOSING STICKS — 6 by 2 in., 8 by 2 in., 12 by 2 in., and 18 by 2 in., adjustable

CUTTER
1. Lead and rule
2. Paper, lever type, 20 in., with pedestal. Should handle 20 by 26-in. sheet
3. Paper, lever type, 26 or 30 in.
4. Paper, lever type, 30 in., with divided back gauge
5. 30 in. to 36 in. power cutter

DESK
1. Bindery, 80 by 36 in.
2. Drying rack
3. Imposing, 51 by 39 in.
4. Make-ready, 32 by 24 in.
5. Paper cutters', 80 by 36 in.
6. Proofreaders'
7. Teacher's

DRYING RACKS
1. Combination drying rack and stock table for platen presses, 30 trays
2. Trays, interlocking, for cylinder press

FOLDING BONES — for hand folding

FOLDING MACHINE — 20 by 26-in. size, 4 fold, two parallel and two right-angle folds, power

FURNITURE — iron, 2 by 4 to 10 by 15 picas

GALLEYS — Steel, 8¾ by 13 in., 6¼ by 23½ in., double column, and 12 by 18 in.

GAUGE PINS — spring tongue

GLUE POT — electric, 1-qt. size

IMPOSING TABLES
1. 12 by 18 in., with iron top, including reglets and furniture
2. 24 by 36 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
3. 36 by 48 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
4. 39 by 63 in., with iron top, complete with drawers, letter boards, reglets, and furniture

INK FOUNTAINS
1. Short, for 8 by 12, 10 by 15, and 12 by 18 presses
2. Long, for 10 by 15, and 12 by 18 presses

KNIVES
1. Overlay, for make ready
2. Ink, 6 and 8 in.
3. Ink, 8 in., square end

LEADER BOXES

LEADERS
1. 6, 8, and 10 pt., fine dot
2. 8 and 10 pt., hyphen

LINE GAUGES
1. Metal, brass, or steel
2. Wood

MALLET

METAL FURNACE — for recasting and refining type metal, used only with typesetting machines

MITERING MACHINE

NUMBERING MACHINES
1. For use on presses
2. Hand machines

ORNAMENTS
1. Assorted floral and decorative designs
2. Border, 6 and 12 pt., decorative

PAPER-DRILLING MACHINE

PERFORATOR
1. 24-in., foot treadle
2. 28-in., foot treadle

PLANER
1. Mallets, hickory or fiber
2. Proof, maple, with felt bottom
3. Type, maple with leather top

PRESSES
1. Cylinder, two revolution, four roller, 17 by 22, complete with variable-speed motor, cast rollers, etc.
2. Platen, 8 by 12, with foot treadle, counter, flywheel guard, platen guard, brake, and set of cast rollers (motor and treadle combination if desired)
3. Platen, 10 by 15, complete with variable-speed motor, counter, flywheel guard, brake, and set of cast rollers, etc.
4. Platen, 12 by 18, complete with variable-speed motor, counter, flywheel guard, platen guard, brake, and set of cast rollers, etc.
5. Proof, 14 by 18, with cabinet
6. Proof, 20 by 24, with cabinet
7. Proof, 23 by 24½, with cabinet
8. Tableting

PUNCH
1. Foot power, multiple with assorted punches
2. Lever, two die, with assorted punches
3. Power, multiple, with assorted punches (paper drill may be substituted)

QUOINS
1. Sizes No. 1 and No. 2
2. Keys, Sizes No. 1 and No. 2

RULE — plain and brass (fonts to fit quarter cases)
1. 2 pt., laborsaving, hair line, side face
2. 2 pt. laborsaving, 1 pt. side face
3. 1 pt., laborsaving, 1 pt. face
4. 2 pt., laborsaving, double face

SAW TRIMMERS — pedestal type, with point gauge, and raising and lowering table

SILK-SCREEN UNIT

SPACING MATERIAL
1. Iron furniture, as selected
2. Leads, laborsaving, 2 pt.
3. Leads, 2-ft. strips, 2 pt.
4. Slugs, laborsaving, 6 pt.
5. Slugs, 2-ft. strips, 6 pt.
6. Spaces and quads
7. Thin spaces, brass and copper, assorted sizes, 6 to 8 pt., one size in each box

SPECIMEN DISPLAY BOARD

STAPLE BINDER — pedestal type, foot power

STEREOTYPING UNIT, 8 by 12 in.

STITCHER — wire, power, capacity ½ or ¾ in., flat- and saddle-back tables

TWEEZERS — 3½ in.

TYMPAN PAPER (with combination holder and cutter)
1. 18 in.
2. 38 in., upright, to be used with cylinder press only

TYPE
1. Body lightface — 8 and 10 pt.
2. Job lightface — 6, 8, 10, 12, 14, 18, 24, 30, 36, and 48 pt.
3. Job lightface italics — 8, 10, 12, 14, 18, 24, and 36 pt.
4. Job boldface — 6 and 8 pt., 12 pt., No. 26; 12 pt., No. 27; 12 pt., No. 28; 18 pt., No. 30
5. Job, light copperplate Gothic — 6 pt., Nos. 1, 2, 3, 4; 12 pt., Nos. 5, 6, 7, 8
6. Job condensed title Gothic — 12, 18, 24, 36, 48, 60, and 72 pt.
7. Job text type — 10, 12, 14, 18, and 24 pt.
8. Job, typewriter type — 12 pt. with spaces
9. Job, boldface italic — 8, 10, 12, 14, 18, 24, 30, and 36 pt.
10. Job, heavy copperplate Gothic — 6 pt., Nos. 21, 22, 23, and 24; 12 pt., No. 25
11. Wood, condensed Gothic — 8, 12, 15, and 18 line
12. 10 pt. line leaders 4 dots to the em
13. 10 pt. braces and dashes
14. 10 pt. fractions
15. 10 pt. references
16. Parentheses and brackets
17. 2 pt. laborsaving leads, 4 to 25 picas
18. 6 pt. laborsaving slugs, 4 to 25 picas
19. 2 pt. laborsaving brass rule
20. 2 pt. miters for rule
21. Laborsaving metal furniture
22. Thin spaces and quarter-size case

TYPESETTING MACHINES
1. Either linotype or intertype, 2 or 3 magazines, and molds
2. Matrices for same, 6, 8, 10, and 12 pt., as selected

VISUAL AID CHARTS

Print-Shop Supplies

BENZINE OR GASOLINE — for cleaning type or presses

BINDERY TAPE — 2 in. wide, brown or black

GOLD BRONZE — pale

INK
1. Bond, black, for bond papers
2. Book, black, for school papers, etc.

(Continued on page 66A)

30,000,000 ENVELOPES
IN STOCK

OVER 700 STOCK STYLES and SIZES of
COIN • CATALOG • COMMERCIAL • CLASP
BARONIAL • and SPECIALTY ENVELOPES

LARGEST "OFF-THE-SHELF" SERVICE
IN THE MIDWEST

Manufacturers & Printers of Envelopes for Schools Printers, Lithographers, Publishers, Stationers, and Industry

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WESTERN STATES ENVELOPE COMPANY
1616 WEST PIERCE STREET • MILWAUKEE 46, WISCONSIN

The ORIGINAL SAW For Every Purpose

MISENER

TEACH efficient, low-cost Modern **HOLE-CUTTING** in Steel, Sheet Metals, Castings, Wood, Plastics, Wallboard, and many other materials with versatile —

"HOLE-MASTER"
MULTI-BLADE HOLE SAWS
MADE ONLY BY MISENER

HOLE SAWS

Illustrated is a MISENER "HOLE-MASTER" Tool—7 Standard Models. This complete line of Multi-Blade Hole Saws includes tools with sets of 4, 5, 6, 7, 9, 11, blades in graduated diameters.

SINGLE CUT HOLE SAWS
Fractional Diameters
5/8" to 15"

COARSE TOOTH BLADES FOR WOOD
1¼", 2", 2½" depths of cut.

Send for —
FREE CATALOG

MISENER MFG. CO., INC.
202-8 WALTON STREET
SYRACUSE, NEW YORK

for rugged . . . *fast cutting*
Power hacksaws, choose

KELLER

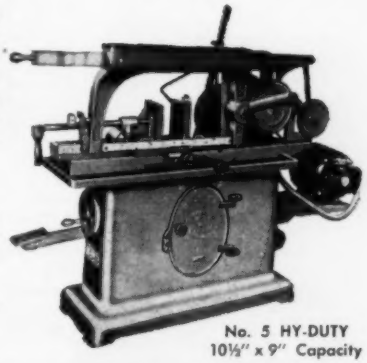
Jefferson #601
4" x 4" Bench Model

A low cost, efficient saw with fast acting swivel vise and pressure relief on back stroke. With or without motor. Standard motor 115 V., 60 cycle, A.C. Installed, wired, ready to operate. Other motors available.

Choose from 10 Models in 5 Capacities from 4" x4" to 10½"x9". Bench and floor models, wet or dry cut are all built for fast cutting with long saw life and minimum maintenance.

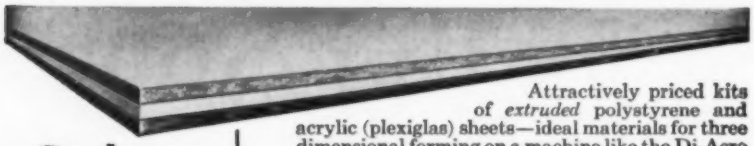
Specialized builders of power hacksaws since 1931.

WRITE for complete details and specifications.



No. 5 HY-DUTY
10½" x 9" Capacity

SALES SERVICE MACHINE TOOL CO.
2365 UNIVERSITY AVE., ST. PAUL 14D. MINNESOTA



Package Bargains on *Extruded* Plastics

Attractively priced kits of *extruded* polystyrene and acrylic (plexiglas) sheets—ideal materials for three dimensional forming on a machine like the Di-Acro Plastics Press (not suitable for internal carving or other handicraft uses). Di-Acro sheet materials have an excellent finish and high impact resistance even after forming. Standard thicknesses of .60, .80, .100 polystyrene and plexiglas available in packages of 10, 25, and 50 sheets. Mixed packages of both materials if desired. 10 standard polystyrene colors, 5 standard plexiglas colors.

For price information please indicate on coupon at bottom of page

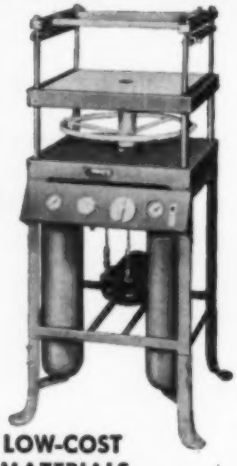
di-acro PRECISION METALWORKING MACHINES

O'NEIL-IRWIN MFG. CO.

351 8th Avenue, Lake City, Minnesota

KEEP PACE WITH INDUSTRY... offer training in plastics this low cost way

NEW, DI-ACRO PLASTICS PRESS FOR SCHOOL SHOPS—ONLY $595.00



This unusual Di-Acro plastics press enables school shops to take plastics out of the purely handicraft stage and to duplicate many creations of the modern plastics industry. The machine will perform all basic operations of the plastics forming industry—mechanical stretch forming, vacuum forming and blow forming.

A unique machine in any school shop, the Di-Acro Press fits well into conventional areas of industrial education. Students can get industrial-type experience from simple machine operation to the most advanced type of three dimensional plastics projects from student-made molds and plugs.

LOW-COST MATERIALS

Forming with the Di-Acro Plastics Press No. 18 makes use of one of the lowest cost materials on the market—the styrenes, in addition to acrylics and vinyls. A variety of colors are available in 18" x 24" sheets of both acrylic and styrene plastics in many thicknesses.

Write for free 14 minute demonstration film "FORMING PLASTIC SHEET MATERIALS" from O'Neil-Irwin Mfg. Co.

pronounced die-ack-ro

di-acro PRECISION METALWORKING MACHINES

PLEASE SEND:

- ☐ Plastics Press Instruction Manual
- ☐ Plastics Price Sheets
- ☐ Plastics for the School Shop

O'NEIL-IRWIN MFG. CO.
351 Eighth Avenue • Lake City, Minnesota

Name_____

School_____

Address_____

(Continued from page 64A)

3. Cover, colors as selected
4. Dryers and compounds, as selected
5. Half tone, black
6. Job, colors as selected
7. Metallic, gold and silver
8. Process, black, red, yellow, blue

KEROSENE — for cleaning rollers

PADDING CEMENT
1. Cold
2. Hot

PAPER
1. Bond, fine grade, 17 by 22 — 20, white
2. Bond, medium grade, 17 by 22 — 20, white
3. Bond, sulphite, 17 by 22 — 20, white
4. Bond, sulphite, 17 by 22 — 20, colors as selected
5. Book, enamel, 25 by 38 — 80, white
6. Book, machine finish, 25 by 38 — 80, white
7. Book, eggshell finish 25 by 38 — 60, white
8. Cover, as selected, 20 by 26, medium
9. Card Bristol, fine grade, 22 by 28 — 4 ply, white
10. Index Bristol, medium grade, 25½ by 30½ — 110, white
11. Index Bristol, medium grade, 25½ by 30½ — 140, white
12. Mill Bristol, medium grade, 25½ by 30½ — 140, colors as selected
13. Pressboard, red
14. Strawboard, No. 40 or No. 50
15. Tagboard, manila, 24 by 36 — 140
16. Tympan, to fit presses
17. Wrapping paper, size as selected
18. Holder for same

PASTE
1. Bindery
2. Make ready

SILK-SCREEN SUPPLIES consisting of:
1. Silk-screen process paste paint, 1 each of the following colors: toluidine red, strontian yellow, ultramarine blue, medium green, rich brown, orange, purple, white, and black
2. Solvent profilm in 11- by 14-in. sheets
3. 8-in. synthetic squeegee
4. 11-in. synthetic squeegee
5. No-clog varnish
6. Film solvent
7. Stencil filler
8. Filler remover
9. Stencil knife
10. Fiber guides
11. Red sable brush — ½ in.
12. Putty knife
13. Frame tape

TWINE — cotton, for tying jobs

WIRE STITCHING
1. No. 28 round wire for stitcher
2. Wire staples, ¼ in.

DESCRIPTIVE MATERIAL

(Continued from page 75A)

with cross references, allow rapid, accurate location of the most probable cause for each mechanical symptom. Illustrations and text on recommended adjustments, etc., are keyed to the check charts. Changers which are mechanically similar are grouped in specific charts. Over 100 check charts and 750 photos are used for quick reference and understanding, and will cover a great many of the simple and complex problems which are common to the many changers covered. Other sections in the book contain information on *tone arm* servicing and amplifiers. A valuable handbook for the service technician or audiophile. It is distributed through electronic parts distributors

(For further details encircle index code 0316)

CORRESPONDING CODE INDEX NUMBERS TO BE ENCIRCLED CAN BE FOUND ON THE CARDS IN THE READER'S SERVICE SECTION

Business and Personal News

DALE T. MUSSLEMAN

Dale T. Mussleman has been made the Convention and Advertising Manager for The Brodhead-Garrett Company. He is a graduate of Ohio Wesleyan University, with a summer at The University of Arizona. He has a degree in Business Administration, received from Wesleyan in 1952. From 1952 to 1955 he was on active duty with The United States Marine Corps as a Second Lieutenant.

He is presently a member of the Reserve Officers Association. From 1955 to 1958, he has been with The Higbee Company in Cleveland, as Assistant Personal Manager, and as an Advertising Assistant.

YATES-AMERICAN MAKES APPOINTMENT

Yates-American Machine Company of Beloit, Wis., manufacturer of woodworking machinery, have announced that Kindt-Collins Company, 12651 Elmwood Ave., Cleveland 11, Ohio, has been appointed stocking dealer for their woodworking machines.

BLACK & DECKER OPENS BRANCH IN TAMPA

As a further step in the continuing improvement of its service to customers, The Black & Decker Manufacturing Company has opened a new sales and service branch in Tampa, Fla. The new branch, located at 3407 S. Dale Mabry Highway, will provide complete repair and service facilities to users of Black & Decker electric tool products in the Tampa-Western Florida area.

Service manager at the Tampa Branch is Edward G. Seiders, who was formerly a repairman in the Richmond, Va., branch. He will be under the supervision of Elmer G. Shue, southeastern regional service manager.

This is the 44th factory service and repair branch opened by Black & Decker in the United States. Besides these, the company maintains eight such facilities in Great Britain, four in Canada, three in Australia, and one each in Belgium, Union of South Africa, New Zealand, Mexico, and Brazil. All branches, which are manned by factory-trained service personnel, are equipped with a complete stock of genuine replacement parts for the Black & Decker line of over 200 different types and models of electric tools.

BROWN & SHARPE ESTABLISHES NEW DIVISION

Establishment of the Cutting Tool Division, under Thomas Hollis, Jr., as its general manager, was announced recently by the Brown & Sharpe Manufacturing Company, Providence, R. I.

The new organization will combine the design, manufacture, and sale of both high-speed steel and tungsten carbide cutting tools. It will continue manufacture of high speed steel cutting tools at the Brown & Sharpe plant at Greystone, R. I., and manufacture of tungsten carbide cutting tools at the Nelco Tool Company plant in Manchester, Conn. The Nelco Tool Company is a wholly owned subsidiary of the Brown & Sharpe Manufacturing Company.

The new division will report to Frederick P. Austin, Jr., vice-president and treasurer of the Brown & Sharpe Manufacturing Company.

BLACK & DECKER RECEIVES AWARD

In the final ratings by an independent board of judges in the Seventeenth Annual Survey of "Financial World," national weekly magazine, The Black & Decker Manufacturing Company was judged for the second consecutive year as having the best annual report of the Portable Tools industry. A bronze "Oscar-of-Industry" was presented to Alonzo G. Decker, Jr., executive vice-president of the company at the annual awards banquet in the grand ballroom of the Hotel Statler in New York City on October 28, 1957.

Approximately 5000 reports were entered in this year's competition. From this number, 1874 qualified for final screening for the bronze trophy awarded in each on 100 industrial classifications. In the Portable Tools classification, Aro Equipment Company was runner-up for the top award, while Snap-On Tools Corporation placed third.

GENERAL SALES MANAGER APPOINTED

Thomas F. MacLaren has been appointed general sales manager for the Machine Tool Division of Brown & Sharpe Mfg. Co., effective January 20, 1958.

Mr. MacLaren, who has been with Brown & Sharpe since 1926, is a graduate apprentice. Since then he has been a section foreman, a foreman, and joined the sales department in 1935. His sales activities have included an assignment in Europe, sales in the Philadelphia territory, and district sales manager at Philadelphia, Los Angeles, and Chicago.

During the past two years, Mr. MacLaren has been director of field sales for the Machine Tool Division of Brown & Sharpe.

4 new "package deals" on machinery for your shop!
Four new "package deals" of Di-Acro Precision Machines are now offered to *school shops only* at these low prices. Brake and Roller are Spartan models, designed especially for schools. Bender, Notcher and Shear are industry proven. Benches are heavy gauge steel.
Deal No. 1 $138500
Spartan Model 24 Roller
Spartan Model 24 Box and Pan Brake
Di-Acro Shear No. 4
Di-Acro Notcher
Di-Acro Bender No. 2
Bender Accessory Package
Bender Stand Machinery Stand
Reg. prices add up to $1535.50
Deal No. 2 $102500
Spartan Model 24 Roller
Spartan Model 24 Box and Pan Brake
Di-Acro Shear No. 4
Di-Acro Bender No. 1A
Bender Accessory Package
Machinery Stand
Reg. prices add up to $1135.50
Deal No. 3 $79500
Spartan Model 24 Roller
Spartan Model 24 Box and Pan Brake
Di-Acro Bender No. 2
Bender Accessory Package
Bender Stand Machinery Stand
Reg. prices add up to $885.50
Deal No. 4 $117000
Spartan Model 24 Roller
Spartan Model 24 Box and Pan Brake
Di-Acro Shear No. 4
Di-Acro Bender
Bender Accessory Package
Bender Stand Machinery Stand
Reg. prices add up to $1290.50
All prices F.O.B. Lake City
di-acro PRECISION METALWORKING MACHINES
pronounced die-ack-ro
All Di-Acro products are backed by one year's warranty.
O'NEIL-IRWIN MFG. CO.
351 8th Ave., Lake City, Minn.
Name
School
Address
Tell me about
Package Deal No. 1
Package Deal No. 2
Package Deal No. 3
Package Deal No. 4

Descriptive Material

CINCINNATI MILLING MACHINE CATALOG

The Cincinnati Milling Machine Company have, for the first time, prepared a general catalog of Cincinnati centertype, roll, and centerless grinding machine attachments. It is listed as Publication No. G-701. Because of the wide acceptance and popularity of Cincinnati Grinding Machines, this new catalog is available to the readers of our magazine upon request.

The products of the Cincinnati Milling Machine Company include special machines and a complete line of milling, broaching, die sinking, and cutter sharpening machines. These products are available from Cincinnati Milling and Grinding Machines, Inc.

(For further details encircle index code 0311)

A NEW METALWORKING FILM

"It's Easy to Bend" is a new, 17-minute, 16mm. color-sound movie describing bending as a basic metalworking process, why it is important, where it has made contributions, and how it is done. It is available on a free loan basis or for purchase from the producer, O'Neil-Irwin Mfg. Company, manufacturers of Di-Acro Benders and other Precision Machines.

The film opens with a review of some of the basic metalworking processes — forging, machining, stamping, etc. — and points out that bending is one of the processes of growing importance. The principle and function of bending are illustrated by showing examples of various product parts being bent. A tool engineer is then introduced and he describes through four case histories selected from equipment used in the home, office, factory, and playground, how bending is important in improving function, strength and appearance of many products plus reducing costs in tooling and production.

This film is designed for showing in industrial education classes at the junior high, senior high, college, and vocational levels. Although it is meant largely to provide an overview to bending as a metalworking process, it also contains some step-by-step instruction material.

(For further details encircle index code 0312)

KODAK PAMPHLET ON PHOTOGRAPHY AND EDUCATION

Eastman Kodak Company have announced a new, free pamphlet, "Photography in Your Future," by A. L. TerLouw, educational consultant for the company. The pamphlet is now available to teachers, guidance counselors, and any adult in scouting or similar leadership activities. It is designed as an aid to those counselors who might be asked to give advice regarding photography as a career.

Based on Mr. TerLouw's lectures on this subject, the booklet discusses photography's important role in today's way of life and the serious consideration it deserves by all young people planning for the future, even if they do not intend to make a career in photography. The many applications of photography in science, engineering, industry-in-general, every phase of commerce, journalism, and many other varied fields are discussed in detail.

The six-page "Photography in Your Future" is available without charge upon request.

(For further details encircle index code 0313)

BERGEN'S NEW CATALOG

Bergen Arts & Crafts, jewelry craft suppliers, have just announced their new catalog which features over 600 different copper shapes for enameling, dozens of new spun bowls, over 100 different enamels, new press molds, more jewelry findings and settings, a whole new line of flat back rhinestones and jewels for ceramic decorations, a complete line of novelties for *boutique* decorations, new items for ceramic studios, how-to-do-it ideas on enameling and jewelry, lustrous new moonstone and rhinestone jewelry, and new findings for shell jewelry.

This "super catalog" of 112 pages, completely illustrated and jam-packed with the most comprehensive line of supplies, is available for 25 cents.

A free folder describing Bergen's Complete Enameling Course is also available upon request.

(For further details encircle index code 0314)

WALL CHARTS FOR AUTO SHOP

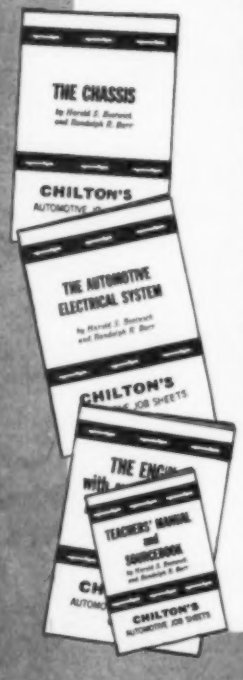
Alondra Sales, Inc., manufacturers of Filt-O-Reg fuel pressure regulators for gasoline engines, offers three 17 by 22-in., color wall charts on (1) how a fuel pressure regulator works; (2) your answer to vapor lock; and (3) how "over-pressure" causes carburetor flooding. These helpful teaching aids are available to all auto shop instructors free. Write for your wall charts on school stationery.

(For further details encircle index code 0315)

SAMS ANNOUNCES NEW MANUALS

Howard W. Sams & Co., Inc., have announced two new manuals in the auto radio removal series, covering step-by-step instructions for the removal of radios, power supply

(Continued on page 72A)



CHILTON'S AUTOMOTIVE JOB SHEETS

Complete, illustrated, step-by-step procedure for Vocational, Technical, High Schools

Following standards recommended by the IA-VE Conference, these **brand new** teachers' aids were created for use in the school shop. Never before available. They conserve teaching time by reducing the need for lecture-type instruction. Separating the "how to" from the "why," these flexible job sheets can be used on live cars or instructional units and varied according to the equipment used.

Write in for copies on 30-day approval:

I. **THE ENGINE WITH SUPPLEMENT ON THE FUEL SYSTEM, $3.80**

II. **The CHASSIS, $2.45**

III. **THE AUTOMOTIVE ELECTRICAL SYSTEM, $2.45**

TEACHER'S MANUAL AND SOURCEBOOK, $1.35

1958 CHILTON'S ORIGINAL AUTO REPAIR MANUAL

29th edition

Over 1000 pages packed with illustration and explanation. Covers every model of every car from 1948 on — even the Edsel is now included! Absolutely essential for teaching automotive classes — used in . . . schools and colleges and by the Army and Navy. The new Auto Repair Manual covers truck specifications for 1957 — a FIRST in a volume of its kind! "I have had occasion to use your publication both as a mechanic and as a teacher of auto mechanics and have always found it very useful." — **Henry Mandel, Supervisor, Division of Industrial Education, The University of the State of New York.**

$7.95

A CHILTON BOOK

CHILTON BOOK DIVISION

Dept. IN, 56th & Chestnut St. Philadelphia 39, Penna.

Automotive Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films and silent or sound movies, may be used by the students in the industrial arts and vocational education courses

AIR COMPRESSOR
1. 3 to 4 cu. ft., with tank, piping, and motor
2. Small portable, 1 cu. ft., with motor

ALIGNING JIG — for connecting rods

ANVIL
1. No. 100 or No. 125
2. Rim

ARMATURE GROWLER AND TESTER

AXLE STANDS

BATTERY EQUIPMENT
1. Cell tester, panel type with discharge rack
2. Charger (15-battery size) with rack
3. Charger (6-battery size)
4. Gas stove (small)
5. Lead-burning torches, with gauges and piping
6. Plate racks

BENCH
1. Electric test, elaborate
2. Electric test, simple
3. Work, with vises
4. Work, portable with vise

BLOWTORCHES — 1-qt. size

BOOKCASE

BRAKE
1. Adjusting stand
2. Band-lining machine

BULLETIN BOARD

CABINETS
1. Wood or metal, for bolts and supplies
2. Wood or metal, for filing job sheets and correspondence

CHAIN HOIST — with overhead trolley and track

CHAIRS
1. Teacher's
2. For tables, or with tablet arms

CHALKBOARDS

CRANE — portable

CRANKSHAFT TRUING TOOL

CREEPERS

DESK — teacher's

DRILL
1. Breast
2. Hand
3. Electric portable, ½ in.
4. Electric portable, ¼ in.
5. Press, 21 in., with motor and chuck

DYNAMOMETER — electric

FORGE — with blower and tools

FURNACES — gas

GREASE DISPENSERS

GRINDER
1. Cylinder, with motor
2. 8 in., and 12 in., with motor

JACKS
1. Lever, 1½-ton
2. Floor, roller

LATHE
1. 11 in. by 4 ft., with motor, chucks, and attachments
2. 16 in. by 6 ft., with motor, chucks, and attachments

POLISHER — power

PRESS
1. Arbor
2. 30 ton

SANDER — power

SPRAY PAINTING OUTFIT

VALVE REFACING AND VALVE-SEAT GRINDING EQUIPMENT

VULCANIZER
1. Electric steam for tube work
2. Small, hand

WELDING OUTFIT — with tanks, gauges, and cutting torch

WHEEL ALIGNMENT
1. Gauge
2. Test table

Automotive Shop — Small Tools

ALCOHOL TESTER

BATTERY
1. Cell tester, prod type
2. Cell tester, cadmium
3. Clips, large
4. Element pullers
5. Fillers
6. Funnels, glass
7. Hydrometer, acid
8. Knives
9. Post builders
10. Post drills
11. Post markers
12. Separator trimmer

BITS
1. Expansive
2. Ratchet brace
3. Wood, 3/16 to 1 in.

BOLT CUTTER — 24 and 36 in.

CALIPERS — 6 in. inside and outside

CANS
1. Oil, ⅛ pt.
2. 1 gal., gas, safety
3. 5 gal., gas, safety
4. 5 gal., kerosene
5. Waste

CHECKS — tool, 1000, blank

CHISELS
1. Cape, 3/8 and 5/8 in.
2. Cold, 3/8, 5/8, ¾, and 1 in.
3. Diamond point

COMBINATION SQUARES — 12 in.

COTTER-PIN EXTRACTOR

DIVIDERS — 6 and 10 in.

DRILL SETS
1. 1/32 to ½ in., by 64ths
2. ½ to 1¼ in., by 32nds

FILE CARDS

FILE HANDLES — assorted

FILES
1. Flat bastard, 6, 8, 10, and 12 in.
2. Half round, 6, 8, 10, and 12 in.
3. Mill, 6, 8, 10, and 12 in.
4. Round, 6, 8, 10, and 12 in.
5. Square, 8, 10, and 12 in.

FIRE EXTINGUISHERS — Pyrene and Acid

FIRST-AID CABINET AND SUPPLIES

FLOOR BRUSHES — 18 in.

FUNNELS — tin, assorted sizes

GAUGES
1. Air pressure
2. Center
3. Depth
4. Thread
5. Thickness

GLASS CUTTERS

GOGGLES

GREASE GUNS — plain and pressure type

HAMMERS
1. Ball peen, 4 oz.
2. Ball peen, 1¼ lb.
3. Ball peen, 2 lb.
4. Lead
5. Riveting
6. Sledge, No. 12

LADLE
1. 3-in. bowl
2. 6-in. bowl

LAMPS — extension, with reels

LEAD POT — gas

MAGNET CHARGER

METERS — volt and ammeter test

MICROMETERS
1. Outside, 0 to 1 in.
2. Outside, 2 to 3 in.
3. Outside, 3 to 4 in.
4. Inside, 1½ to 6 in.

MOLDS
1. Battery nut
2. Battery post
3. Battery strap
4. Burning stick
5. Lead hammer

OILSTONE

PIPE TAPS, ⅛, ¼, ⅜, and ½ in.

PLIERS
1. Combination, 6 in.
2. Flat nose
3. Roundnose

PULLERS
1. Bearing
2. Gear
3. Wheel, hub type

PUNCHES
1. Center
2. Taper pin
3. Blacksmith

PUTTY KNIVES

REAMER — spindle bolt

REAMER SETS
1. Piston pin, ½ to 1⅜ in.
2. Taper pin
3. Valve seat

SAWS
1. Hack, frames, 10 in., adjustable
2. Hack-saw blades, 18, 20, and 24 teeth
3. Hand

SCALES
1. Steel, 6 in., graduated 1/64 and 1/100 in.
2. Steel, 12 in., graduated 1/32 in.

SCRAPERS
1. Bearing
2. Carbon

SCREW DRIVERS
1. 6 and 12 in.
2. Small combination

SCREW EXTRACTORS

SCRIBERS

SNIPS — tin, 3 in. straight and 3 in. curved

SOLDERING COPPERS
1. Assorted
2. Electric
3. Handles

SPRING SPREADERS

STAMPS
1. Figures, 3/16 in.
2. Letters, 3/16 in.

TAP-AND-DIE SETS
1. Machine screw
2. N.F. ¼ to 1 in.
3. N.C. ¼ to 1 in.

TIRE TOOLS

TOOL KIT — metal box or canvas roll, empty

TWIST DRILLS — (extra sets) selected sizes

VALVE
1. Grinders (hand)
2. Spring lifters

WRENCHES
1. 8, 10, 12, and 18 in.
2. Ignition sets
3. Pipe, 10, 14, 16, and 18 in.
4. Rim socket
5. Socket sets, large assortment with case
6. Spark plug
7. Speed wrenches
8. Standard end sets, ¼ to 7/8 in., N.C. and N.F.
9. Valve-tappet wrenches

Materials and Supplies

ABRASIVE CLOTH AND PAPER — aluminum oxide and silicon carbide

ACETYLENE GAS — in drums, for welding

ACID

ALCOHOL

BABBITT

BEARING BLUE

BEARING COMPOUND
1. 600W
2. Penetrating

BOLTS
1. Machine, selected sizes
2. N.F. selected sizes
3. Stove, flat or round heads, selected sizes

BRAKE JUICE — ½-pt. cans

BRUSHES
1. Paint
2. Spark plug
3. Spoke
4. Steel
5. Varnish

CHAMOIS

(Continued on page 70A)

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WILLIAMS DROP FORGED

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- ☐ Set-up Accessories
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- ☐ Hoist Hooks & Eye Bolts
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(Continued from page 69A)

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DRAIN COCKS
ELECTROLYTE
ENAMEL — AUTO PAINTING
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3. Flange

GASOLINE
GREASE — cup, cans
KEROSENE
KEYS, WHITNEY — assorted
LACQUER — colors
LEAD
LUBRICANT — transmission
NAILS AND BRADS
NUTS
1. N.F., castellated, square, hexagon, selected sizes and kinds
2. N.C., square and hexagon, selected sizes
3. Machine screw, selected sizes
4. Wing, selected sizes

OIL — Cylinder, light, medium, and heavy
OXYGEN — in drums for lead burning
PIG LEAD
PISTON-RING COMPRESSORS
RADIATOR HOSE
RIVETS — brake lining, 5/16, 1/2, and 3/4 in. long
SCREWS
1. F.H. or R.H., iron or brass, selected sizes and kinds
2. Cap and machine, iron or brass, selected sizes and kinds

SEALING COMPOUND
SHELLAC — 1/2-pt. cans
SHIM STOCK
SOAPSTONE
SOLDER — bar, wire, or self-fluxing wire
SOLDERING PASTE
SPELTER — for brazing
SPONGES — 1/2 lb.
STARTING CABLE
TACKS AND STAPLES — upholstery
TIRE
1. Carcass fabric
2. Cushion stock
3. Inner-tube repair stock
4. Patching cement
5. Patches
6. Putty
7. Tread stock
8. Vulcanizing

VALVE-GRINDING COMPOUND — coarse and fine
WASHERS
1. Lock, assorted sizes
2. Wrought iron

WASTE
WIRE — primary and secondary

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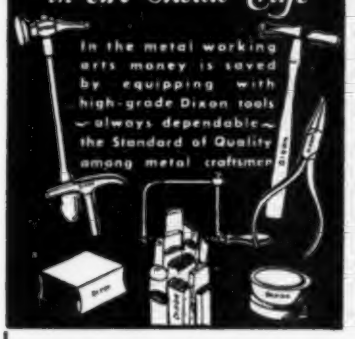
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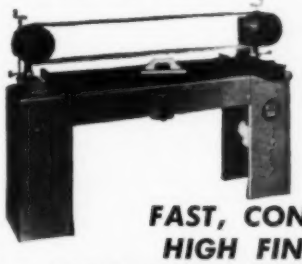

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GENERAL SHOP HANDBOOK

Newly revised for 1958, this outstanding text covers a complete, well-organized general course. Includes 12 drawing units, 13 woodworking units, 16 metalwork units, 9 finishing units, 6 plumbing and pipe-fitting units, 10 concrete work units, 12 electrical work units, 10 tool sharpening and reconditioning units and 9 special units each contain an illustrated list of tools classified according to use, information details and operation procedures of a fundamental nature. New material is included on plastics and leather. Many fine illustrations.

WILLOUGHBY and CHAMBERLAIN . $1.64

LEATHERCRAFT

New for 1958! Superbly organized and planned to give the individual who is completely unfamiliar with the subject a good knowledge of basic information and procedures preparatory to undertaking any projects on his own. Projects presented and executed on a step-by-step basis instead of in unconnected form, enabling the student to learn by doing the things required to make a sample project. Outstanding photographs and drawings show techniques, which is far superior to verbal description. Contains an outstanding collection of fine projects plus an incomparable coverage of tools. Nearly 300 large, clear drawings and photographs.

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AUTOMOTIVE EQUIPMENT

(Continued from page 62A)

STARTING MOTORS

Order starting motor types which are used on current model automobile engines. Order complete with starting switch (manual and automatic) and with engaging mechanisms (Bendix and overrunning clutch)

STEERING GEAR ASSEMBLY

Order steering gear assemblies used on current model automobiles, complete with shifting lever, wheel, arm, column, and shifting link arms (basic training element). Include power steering types

TRANSMISSIONS

1. Order conventional transmissions used on current model automobiles
2. Order automatic type transmissions used on current model automobiles.

Furniture

The shop furniture should be in keeping with furniture used by other classes in other rooms of the school. Especially in the shop, it's wise to keep furniture painted, varnished, polished, and well cared for.

BENCHES — *see* section on Special Equipment and Testing Devices

BULLETIN BOARD

CABINET

1. Steel supply, 36″ x 18″ x 72″ cabinet, double doors, locking, 4 shelves
2. First aid cabinet, 5″ x 12″ x 20″ steel for first aid supplies, painted white

CHALKBOARD

DESK, TEACHER'S — 5 drawer

FILES — 4 drawer, legal size

FIRE EXTINGUISHER

Approved types according to local building and safety codes

SEATING

Provisions should be made for seating class: tablet arm seats are recommended

PROJECTOR

1. 16mm. sound motion picture projector
2. 35mm. comb. with 2″ slide still-projector

SCREEN

6′ x 8′ beaded screen, tripod or wall mtng.

DESCRIPTIVE MATERIAL

(Continued from page 68A)

units, and speakers from automobiles. The two new volumes cover 1956 and 1957 models of American cars. The previous volume gave 1955 coverage.

For every auto covered, there is given a list of the tools required; a phantom view of the dash panel with the radio in place which enables the technician to easily and quickly locate chassis mounting nuts or bolts, cables, antenna lead, and speaker leads; and a photo of the radio actually being removed.

Also listed with each model is rear-seat speaker data. This information indicates if there is a cutout provided, the size speaker required, and if control of the speaker must be added or if it is provided on the radio.

"Auto Radio Removal — 1956" and "Auto Radio Removal — 1957" contain 104 pages each, and utilize a plastic comb binding that allows the books to lay flat for easy reference. Sold through electronic parts distributors, the volumes carry Catalog No.'s ARR-56, and ARR-57, and each volume sells for $2.95.

Sams also announces "Tape Recorder Manual, Vol. I" — the first of a new series of Tape Recorder Service Manuals. It covers 7 basic tape recorder chassis and 2 tape players produced in 1956 and 1957. Both home and professional type recorders are covered. Complete authoritative information includes general operation data, use of external speakers, mechanical and amplifier adjustments, cleaning, lubri-

(Continued on page 75A)

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Include Shop Projects Requiring These New Wonder Materials in Your Plastics Course, and Teach Your Students New Skills They Will Use On-The-Job!

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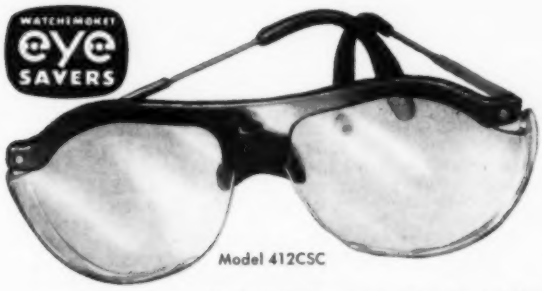

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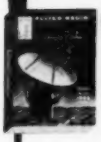

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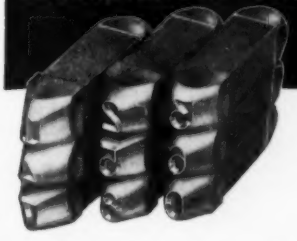

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4. Glaze

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1. Feldspar
2. Flint
3. Gum arabic
4. Kaolin
5. Kiln patching cement
6. Kiln wash
7. Metallic oxides
8. Opax
9. Plaster of Paris
10. Plaster separator
11. Silicate of soda
12. Soda ash
13. White lead
14. Whiting
15. Zircopax

CLAY
1. Red modeling
2. White modeling
3. Fine white flower making clay
4. Porcelain

CONES — Pyrometric, 08–04 standard or junior; 020–018 standard or junior

CROCKS
1. 1-gal. size for glazing with covers
2. 5-gal. size for clay storage with covers
3. 10-gal. size for clay storage with covers

DAMP CABINET — old refrigerator or shop made

FETTLING KNIVES

GLAZES
1. Art
2. Crackle
3. Cold
4. Overglaze, various colors
5. Platinum
6. Under and overglaze mediums
7. Underglaze, various colors
8. Luster
9. Majolica
10. Matt

JARS — Pint and quart for storing glazes

KILNS
1. Plate rack
2. Posts
3. Spurs
4. Standard stilts
5. Star stilts
6. Tile setters
7. Triangles

KILN SHELVES
1. Full
2. Part

MODELING TOOLS
1. Boxwood
2. Fine-art plaster working
3. Lace tools
4. Moss decorator
5. Plaster
6. Sgraffito
7. Slip tracers
8. Wire loop

PITCHERS
1. Large — slip pouring
2. Small — glaze pouring

PLASTER-OF-PARIS MOLDS
1. Animals
2. Ash trays
3. Book ends
4. Candleholders
5. Candy dishes
6. Cigarette boxes
7. Dishes
8. Figurines
9. Flowerpots
10. Lamp bases
11. Mugs
12. Novelties
13. Planters
14. Salt and pepper shakers
15. Trays
16. Vases

POTTER'S WHEEL
1. Electric — constant speed, variable speed
2. Kick

SCALES

SIEVES OR STRAINERS — 30 mesh, 50 mesh, 80 mesh

SPONGES
1. Cellulose
2. Elephant ear

SPRAY BOOTH
1. Blower
2. Filters
3. Mask for spraying

SPRAY GUNS
1. Electric
2. Hand

TURNING TOOLS
1. Finishing rubbers
2. Rib
3. Right-and left-hand
4. Scrapers
5. Wire

WEDGING BOARD

Office Machines Repair, Equipment, Tools, and Supplies

The following lists for establishing an office machines repair program are minimum requirements. Additions may be necessary depending upon the extent to which training includes specialized office equipment.

The supply lists are minimum and include those items which should be stocked for general use. Specialized supplies required would depend upon the types and kinds of repairs being made.

Equipment

AIR COMPRESSOR — Pressure range 90 to 120 lbs.

AIR HOSE — 5/16 in. I.D. by 25 ft. with quick detachable connections

CABINET, SMALL PARTS — 10 drawer; 20 9/16 by 30 9/16 by 15 1/8 in.

DRILL PRESS — Complete with 1/2 in. Jacobs chuck, 10 in. by 10 in. working table

EXHAUST FAN — 1/4 h.p.-115 v., 60-cycle, single phase; fan diameter 16 in. — 6 blades, V belt drive, 2140 r.p.m., CFM 1945

GAUGE, SOLDERING

GRINDER — 6 in. H.D. Wheel — 6 in. by 3/4 in. face by 1/2 in. hole; 1/3 h.p., 115 v., single phase, 60-cycle, 3600 r.p.m. with guards, switch, cord tool rests, grinding wheels

LAMP, BENCH TYPE — Air cooled incandescent — 60-watt

LIGHT, VAPOR PROOF — 10 in. diameter, 30° adjustment, with conduit connection

LIGHTS, UNIVERSAL BENCH — With shade

MAGNETIZER-DEMAGNETIZER — 110 v., a.c.-d.c.

OVEN, ELECTRIC — 225° F @ 1000 watts; motor driven, forced-air ventilation, 30 in. wide, 25 in. deep, 24 in. high, 110 v. a.c., single phase, with thermometer

PARTS, CLEANER — Jet 38 in. long, 21 in. wide, 34 1/2 in. high; 110 v., 60-cycle a.c., single phase

SCREWPLATE — Including 4–36, 6–32, 8–32, 10–24, 10–32, 12–24, 1/4–20

SPRAY, BOOTH — With ventilation; inside 3 by 4 ft. by 6 ft. 10 in. high

SPRAY, GUN — Complete with KS-503 suction feed cup attachment, with quick detachable connector

TRANSFORMER, AIR

TURNTABLE, BENCH — With brake

VISE — Swivel type, jaws 2 in. wide

Small Tools

ALIGNER
1. Royal side
2. Underwood side
3. Side
4. Royal type

BENDER
1. Link
2. Universal bar
3. Royal trip
4. Royal ribbon vibrator arm
5. L.C. Smith sublever
6. Royal bottom rail
7. Underwood back space
8. Woodstock lower bar

BLOW TORCH — Alcohol, blow 1 1/4 by 7 1/4 in.

CLEANING, GUN (Air)

FILE
1. 6 in. warding
2. 4 in. warding
3. 6 in. segment
4. 6 by 1/4 in. pillar
5. 6 by 1/2 in. pillar
6. 6 by 1/2 in. course pillar
7. 6 in. half round
8. 6 in. square

HACKSAW — Adjustable 10 in. — 12 in. blades

HAMMER
1. Ball peen, 6 oz.
2. Brass, 8 oz.

MILL, UNDERWOOD PLATEN END LOADER, ROYAL PINION BALL

OIL STONE — One side coarse, and the other fine

OIL STONE, TRIANGULAR

OIL CANS
1. Bench 8 oz.
2. Kit 1 oz.

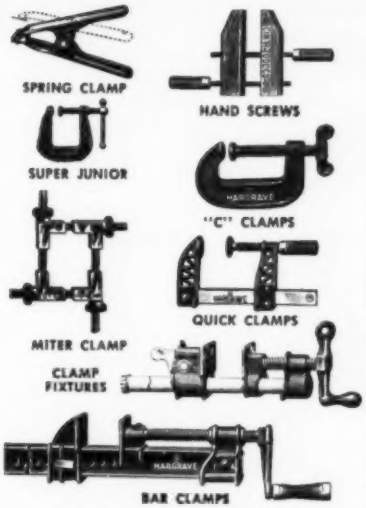
PLIERS
1. 3 prong 7 in.
2. 9 prong 8 in.
3. Peening 7 in.
4. Wiring 7 in.
5. Long round prong 7 in.
6. Flat duck bill 7 in.
7. Parallel jaw 7 in.
8. Parallel jaw vise 8 in.
9. Chain nose side cutting 7 in.
10. Parallel jaw cutters 8 in.
11. Key lever peening 8 in.
12. Key ring 7 in.
13. Curved needle nose
14. Ribbon eyelet, male and female
15. Diagonal cutting
16. With type cutting jaws
17. With wire cutting jaws
18. Vise grip

PICK, ROYAL SEGMENT

PUNCH
1. Centering
2. Pin

(Continued on page 76A)

HARGRAVE
The Complete Line of Tested **TOOLS**



Stocked by Your Local Distributor
WRITE FOR FREE CATALOG
Shows a complete line of Clamps for all purposes, openings from ¾" to 12' and depths from 1¼" to 16". Chisels, Punches, Masonry Drills for hand and power hammers, Carbide Rotary Drills, Gasket Cutters, File Cleaners, etc.

THE CINCINNATI TOOL CO.
Waverly & Main Cincinnati 12, Ohio

DESCRIPTIVE MATERIAL

(Continued from page 72A)

cation, etc. For each recorder covered there is complete information on troubles and probable remedies, plus complete mechanical and electrical parts lists.

An invaluable book for technicians or audiophiles and distributed through electronic parts distributors, this manual carries Catalog No. TR-1. It contains 148 pages, 8½ by 11 in., and is priced at $2.95.

A completely new record changer manual —"Automatic Record Changer Manual, Vol. 10," will give more complete record changer coverage than previous Sams publications. It covers 10 record changers produced in 1956 and 1957. Coverage includes general specifications and operation data, changer cycle, mechanical adjustments, lubrication points, etc. For each changer there is complete information provided on troubles and probable remedies, plus a mechanical parts list. Photos and exploded views give complete assembly and parts list information. A complete index of record changer coverage on this volume and other Sams publications is also included.

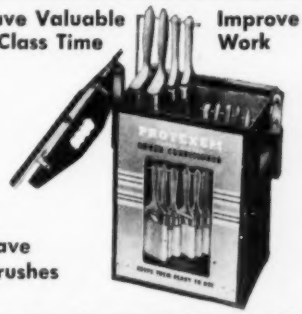
Distributed through electronic parts distributors throughout the country, "Automatic Record Changer Manual, Vol. 10," carries Catalog No. RC-10, contains 148 pages, 8½ by 11 in., and is priced at $2.95.

"Pinpoint Record Changer Troubles in 5 Minutes" is the title of a new spiral bound, 5½ by 8½-in. handbook which contains 320 pages and is priced at $3.95. Catalog No. is CTB-21.

This book deals primarily with trouble location and correction of record changers produced from 1946 to mid-57, as well as many foreign makes. Simple check charts, along

(Continued on page 66A)

Save Valuable Class Time — Improve Work



Save Brushes

PROTEXEM
VAPOR ACTION BRUSH CONDITIONER

A MODERN SCIENTIFIC METHOD for storing, preserving and reclaiming brushes.
VAPOR ACTION keeps **NATURAL BRISTLE and NYLON** brushes ready to use. Reclaims HARD-AS-ROCK brushes.
BRUSHES HANG IN VAPOR not in liquid. VAPOR penetrates the paint in brushes and keeps them soft. **BRUSHES ALWAYS READY** to use.

A New Approach to Paint Brush Care

ASK ABOUT OUR 30 DAY FREE TRIAL and bulletin, "NEW APPROACH to PAINT BRUSH CARE."

Write for complete information
WISCONSIN LABORATORIES, Inc.
Dept. IA **Dousman, Wisconsin**

APRONS are a necessity in your shop!

Can-Pro high quality aprons provide economical clothing protection and a neat, uniform appearance of your class. Aprons are not expensive. One apron costs less than a cleaning bill resulting from one shop mishap.

EXPERTLY MADE OF TOUGH, LONG-WEARING MATERIAL

Full cut, properly fitted to protect clothing. Strong tapes. Two roomy pockets for pencils, notebooks, etc. Low cost, Can-Pro aprons have served the schools for over 38 years.

FREE APRONS! *WITH EACH DOZEN APRONS YOU BUY, WE GIVE YOU ONE FREE APRON. USE THESE FREE APRONS FOR EMERGENCY - OR FIGURE YOUR COST ON THE BASIS OF 13 APRONS FOR THE COST OF ONLY 12.*

ALL APRONS SENT PREPAID! 30 DAYS TO REMIT. IF YOU DESIRE, WE'LL CHARGE TO YOUR SCHOOL BUDGET.

ECONOMY DRILL APRONS

Provided with PERSONNEL PLAN CARDS which fit into a cardholder pocket. A set of cards are printed with Supt., Foreman, Safety Engineer, Secretary, Stockroom Foreman, Toolroom Foreman and Maintenance. Both instructor and student will benefit through the use of this educational PERSONNEL PLAN. Develops leadership and respect for authority. Helps the instructor manage a large class by permitting students to handle routine details.

ECONOMY aprons come in TAN, BLUE, GREEN OR ORANGE. Colors can be used to designate different jobs within a class, or TAN can designate woodworking, BLUE metal working, GREEN automotive, etc.
ONE FREE APRON WITH EACH DOZEN!

SIZE	LESS THAN 12	12 TO 24	24 TO 49	50 OR MORE
24 x 28	$1.05	$1.00	$ .95	$ .90
28 x 35	1.10	1.05	1.00	.95
28 x 40	1.15	1.10	1.05	1.00
28 x 45	1.25	1.20	1.15	1.10

1 FREE APRON WITH EA. DOZEN ORDERED

HEAVY DUTY APRONS FOR ROUGH WORK
Without PERSONNEL PLAN CARDS. BLUE denim and BLUE/WHITE hickory stripe denim. 24 x 28 in BLUE denim only.
ONE FREE APRON WITH EACH DOZEN!

SIZE	LESS THAN 12	12 TO 24	24 TO 49	50 OR MORE
24 x 28	$1.10	$1.05	$1.00	$ .96
28 x 35	1.30	1.25	1.20	1.15
28 x 42	1.40	1.35	1.30	1.25
28 x 45	1.45	1.40	1.35	1.30

Prices slightly higher west of Rockies. Sizes shown are "cut sizes" before hemming.

FREE! SHOP ORGANIZATION TEXT BOOK
Included with your apron order. Solves many problems of class management. Tells you how to organize your class just like management system used in industry. Ten chapters - over 60 pages with many illustrations and charts. Well written by shop authorities.

EXCLUSIVE INSTRUCTORS SHOP COATS
Designed by instructors. Not sold in stores. Buy on approval! Sanforized and colorfast. Sizes 36 to 46. Blue, Green, Tan, Grey or White.
SC SHOPMAN - Swinging tool pocket. Pencil pocket. Two lower pockets with flaps to keep dirt out. Matching metal snaps. Pleated action back with belt. Side vents. Double cuffs. $7.75 or 2 for $14.95 PREPAID!
LC CLASSMAN - Pencil pocket. Two lower pockets. Box style back with belt. Matching metal snaps. Side vents. $6.50 or 2 for $12.50 PREPAID!
1 SC SHOPMAN AND 1 LC CLASSMAN - $13.75 PREPAID!
(Large sizes available.) (Prices higher west of Rockies.)

"The School Apron Folks"

CAN-PRO *Corporation* 29 E. McWilliams St. Fond du Lac, Wisconsin

(Continued from page 74A)

REWINDER, RIBBON
ROLLER TYPE BAR — 8 in.
STRIPPER, PLATEN
SOCKETS, ROYAL
1. 7/32 in.
2. 1/4 in.
3. 5/16 in.
4. 9/32 in.
5. 3/8 in.
SCREWDRIVER
1. Royal 7/32 in.
2. Split nut 10 in.
3. Split blade 12¾ in.

4. Shank	Blade Length	Overall Length
5/32 in.	2 in.	4⅛ in.
5/32 in.	3 in.	5⅛ in.
5/32 in.	4 in.	7¼ in.
5/32 in.	10 in.	13⅞ in.
7/32 in.	4 in.	8¼ in.
7/32 in.	7 in.	11¼ in.
5/16 in.	8 in.	12⅞ in.

SCRIBERS, SPRING HOOK
TOOL, KEYRING REMOVING
TWEEZERS — 6 in.
HAND VISE
WRENCH — Underwood electric impression control screw adjusting
1. Royal — Open end, 1/4, 7/32 + 9/64, 5/16, 17/16, 13/32, 9/16 + 9/64, 3/8 in.
2. L. C. Smith — ½ and ¾ in. (Motion); escapement; ribbon friction adjustment
3. Remington — ¼ + ½ in., ⅜ + 7/32 in., 5/16 + 3/16 in., ¼ + ⅜ in., 15/64 + 5/16 in.
4. Escapement
5. Motion adjustment nut
6. Segment shift stop screw nut
7. Margin release lever shaft stop screw
8. Ribbon vibrator universal bar
9. Woodstock, ⅛, ¼, ⅜, 9/16 in
10 Toggle 5/16, ¼, 7/32, ⅜ in.
11. Box — ¼ + 3/16 in. offset
12. Carriage rail screw
13. Universal bar nut upper

Supplies

BRUSHES
1. Tapered wire handle
2. Large cleaning
3. Enamel
4. Oil
5. Type cleaning
6. Benzine
7. Transfer cement
BUFFING COMPOUND — 2 lb. cans
CLOTH CLEANING-POLISHING
CEMENT, TRANSFER — 4 and 8 oz. cans
CLEANER, TYPE — 2 oz. — 7 oz. cans
EMERY CLOTH — Fine, medium, and coarse
ENAMEL, WRINKLE
1. Black
2. Grey
3. Brown
HANDLE, FILE
1. Large
2. Small
KIT, DECALCOMANIA
LACQUER, SPRAYING
1. Black gloss
2. Black dull
3. Grey, brown, green
4. Clear
LACQUER STICK, ENGRAVERS'
1. White
2. Black
3. Red
4. Blue
5. Yellow
6. Green
7. Gold
8. Silver
MARKING CRAYON OIL
1. Light typewriter
2. Non fluid ball bearing
POLISH, CLEANER — 8 oz. cans
PADS, TYPEWRITER
1. Wool felt
2. Sponge rubber
PASTE, SOLDERING
REDUCER, ENAMEL
REMOVER, RUST & TARNISH — 8 oz. cans, pts., qts.
STEEL WOOL
SOLDER
1. Acid core
2. Rosin core
THINNER, SPRAYING

Refrigeration Equipment, Tools, and Supplies

These lists for establishing a refrigeration program include all basic items. Individual instructors will likely devise special units and construct these units as necessary to augment standard equipment and small tools. Supplies listed include those items which should be stocked in the shop. They do not include specialized items necessary during the repair of specific refrigeration units.

Equipment

ACETYLENE REGULATOR, WELDING — 30 lb., 400 lb. capacity
ANALYZER, HERMETIC
BENCHES
1. Soldering
2. Service and assembly

(Continued on page 78A)

Oregon the friendly state for SUMMER SESSION
Study and Fun

OREGON STATE COLLEGE
DEPARTMENT OF
INDUSTRIAL EDUCATION

SUMMER SESSION
JUNE 23-AUGUST 15, 1958

TECHNICAL COURSES: All usual courses in Woodworking, Metal Working, Drafting and Design, plus advanced work in Metal Spinning, Boat Building, Recreational Handicrafts, Metalcrafts.

PROFESSIONAL COURSES: *For I.A. majors*—Project Design Seminar, Project Analysis, Course Construction, School Shop Planning; Workshops in Leathercraft, Plastics, Basic Electricity, Electronics, General Metalwork, Driver Education.
For T. & I. majors—Analysis and Course Construction, Teaching Methods and Materials, Tests and Measurements, Conference Leader Training, Seminars and Workshops.

GENERAL EDUCATION COURSES include guidance and counseling, audio-visual education, school administration and all related areas.

NOTE: Please write direct to school.

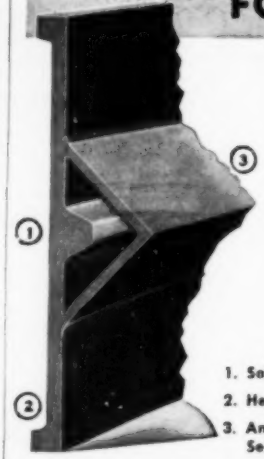
Graduate or undergradute work under competent resident and visiting instructors, amid scenic wonders—national parks, Pacific beaches, mountains, trout streams, lakes—in a *genuinely stimulating climate*. A summer you will enjoy!

THE STUDENT may plan a program which, through successive summers at this widely recognized school, will lead to a bachelor's or master's degree. Approved programs carrying the recommendation of Oregon State College are accepted by all state departments of education for either a *Special* or a *General Secondary Credential*.

Dept. of Industrial Education
OREGON STATE COLLEGE
Dept. C8 · Corvallis, Oregon

Authorized by OREGON STATE BOARD OF HIGHER EDUCATION

STERLING is the *Original* and *Only*
ROLLED STEEL CHANNEL
FOUNDRY FLASK



When you specify Sterling Flasks, you get the very best that money can buy. For Sterlings are backed by almost a half century of "know-how" in fabricating precision-built foundry flasks. Sterling pioneered and perfected the famous ROLLED STEEL CHANNEL construction, long proven superior under rough foundry usage. That's why, today, you will find Sterlings in more than 4500 foundries. Write for Catalog No. 69A describing the complete line of Sterling Foundry Equipment.

STERLING WHEELBARROW COMPANY
Milwaukee 14, Wis., U.S.A.

1. Solid Rolled Reinforcing Rib
2. Heavy Square Flanges with Full-Width Bearing
3. Angle Reinforcement Welded Around Flask Section

WAYNE STATE UNIVERSITY

1958 Summer Session Beginning June 23 for Six, Eight, or Ten Weeks

FEATURING:

PLASTICS — Design of plastic projects; Analysis of operations and demonstrations.

HYDRAULICS — Curriculum materials and basic instruction for drafting and other technical teachers.

ADMINISTRATIVE AND SUPERVISORY FUNCTIONS OF VOCATIONAL EDUCATION

LEGAL AND INDUSTRIAL RELATIONS ASPECTS OF VOCATIONAL EDUCATION

EDUCATIONAL POLICIES OF INDUSTRY, BUSINESS, AND LABOR IN THE COMMUNITY — Directed trips in Detroit area.

RESEARCH PROCEDURES — Research in and for industrial or vocational education

PHILOSOPHY AND TRENDS IN VOCATIONAL AND PRACTICAL ARTS EDUCATION

August 4-15 TERMINAL VOCATIONAL PROGRAMS IN COMMUNITY COLLEGES.

August 18-29 INSTITUTE FOR TRADE AND TECHNICAL TEACHERS OF RADIO, ELECTRONICS, AND TELEVISION.

LIVING ACCOMMODATIONS ON CAMPUS

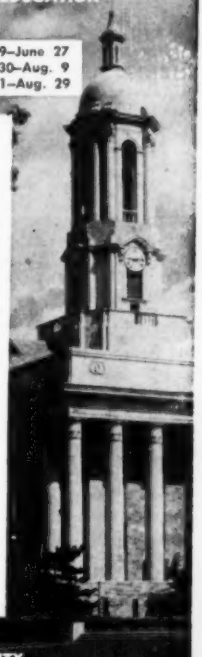
WRITE TO:

DEPARTMENT OF INDUSTRIAL EDUCATION
College of Education
Wayne State University Detroit 2, Michigan

THE PENNSYLVANIA STATE UNIVERSITY

Department of INDUSTRIAL EDUCATION

1958 SUMMER SESSION
INTER-SESSION — June 9–June 27
MAIN SESSION — June 30–Aug. 9
POST-SESSION — Aug. 11–Aug. 29



Vocational Industrial and Industrial Arts Education

Doctors, Masters and Baccalaureate Degrees

Separate graduate and undergraduate curricula in vocational industrial and in industrial arts education for in-service teachers, supervisors, administrators, and other qualified individuals. Short unit courses dealing with national, state and local problems.

For further information and catalog address:

Director of Summer Sessions
Room 101, Willard Hall
THE PENNSYLVANIA STATE UNIVERSITY
University Park, Pennsylvania

THE PENNSYLVANIA STATE UNIVERSITY
University Park, Pennsylvania

--BRADLEY UNIVERSITY

Announces the 1958 Summer Session

Comprehensive courses are offered in Industrial Arts and Technical Education at both undergraduate and graduate levels during each of two terms.

Balanced Professional and Shop Courses

A wide variety of courses are offered in the following areas:

EDUCATION
LIBERAL ARTS AND SCIENCES
INDUSTRIAL AND TECHNICAL EDUCATION
ARTS AND CRAFTS
BUILDING CONSTRUCTION
ELECTRICITY AND ELECTRONICS
MACHINE DRAFTING AND DESIGN
METAL
WOOD

Six semester hours credit may be earned in each of the five-week sessions.

First Term, June 16—July 19
Second Term, July 21—August 23

For additional information write Director of Summer Session, Bradley University, Peoria, Illinois

SPECIAL WORKSHOPS ON PRODUCTION AND AUTOMATION FOR INDUSTRIAL ARTS, AND ON CREATIVE DESIGN FOR INDUSTRIAL ARTS TEACHERS

Minnesota

SUMMER SESSION

FIRST TERM June 16—July 19 • SECOND TERM July 21—Aug. 23

GRADUATE STUDY with distinguished faculty

UNDERGRADUATE WORK in all regular schools and colleges offering more than 1000 outstanding courses

LIBRARY, LABORATORY, and RESEARCH facilities of excellent quality

SPECIAL WORKSHOPS and INSTITUTES

RECREATION—symphony and other concerts—plays—lectures—excursions—golf—tennis—swimming—athletic program—on campus in a cultural center located in a playground of 10,000 lakes.

For Bulletin write Dean of Summer Session, 813 Johnston Hall

UNIVERSITY of MINNESOTA
MINNEAPOLIS 14, MINNESOTA

(Continued from page 76A)

CHUCK, ENGINE LATHE
1. 5 in. — 3 jaw universal
2. 7½ in. — 4 jaw independent

CUTTER PIPE — Capacity ⅛ to 2 in.

DOG, ENGINE LATHE — ½ to 4 in.

DRILL PRESS — Floor type, No. 2 Morse Taper-Jacobs chuck, capacity ¾ in.

DRILL
1. ¼ in. HD 7¾ in. overall
2. Morse straight shank HS set 1/16 to ½ in. by 64ths
3. Morse straight shank HS set A to Z sizes
4. Morse straight shank HS set Nos. 1 to 70, with block

EXTRACTOR — Bearing No. 1

FURNACE SOLDERING — 14 in. long, 13,000 BTU, fire pot opening 4½ by 3 in.

GRINDER — 115 v., single phase, 60-cycle, 10 by 1 by ¾ in. wheels, 1800 r.p.m.

GROWLER, ELECTRIC
1. Range 2 to 7 in., face 2¼ in., 110 v., 60-cycle
2. Range 2 in. up, face 4 in.

IRON, ELECTRIC SOLDERING — 300 watt, 110 v., a.c.-d.c., 14½ in. long, ⅞ in. tip

OHMMETER — Range .5 Ohm — 50,000 Ohm

OPERATION RECORDER — a.c. & d.c. up to 60 cycles, voltage range 120–250 volt

OVEN, ELECTRIC — 225° F. at 1000 watts, motor driven forced-air ventilation, 30 in. wide, 25 in. deep, 24 in. high, 110 a.c. single phase, with thermometer

OXYGEN REGULATOR, WELDING — 100 to 3000 lb. capacity, maximum delivery pressure, 50 lb.

PRESS, ARBOR — 1 ton capacity-Ram, 1 by 1 by 7 in., with slotted plate, single leverage

PUMP — Blower-vacuum, air cooled, 4.3 cu. ft. per minute. Pipe outlet-inlet ½ in., maximum pressure intermittent duty, 25 lb. maximum vacuum, intermittent duty 28.5 in., 115 v., a.c. 60-cycle, single phase, ½ h.p. motor

REAMER, PIPE — Capacity ⅛ to 2 in., HS cutter

SCREW PLATE — Including NC-NF standards

STARTER AND ANALYZER — Capacity up to ⅓ h.p.

TEMPERATURE RECORDER — 20° F. to +130° F. capacity, complete with charts

TESTER — Field coil, 110–220 v., 60-cycle

TESTER — Thermostatic control

THREADER — Ratchet pipe, capacity ⅛ to 1¼ in.

TOOL HOLDER
1. Engine lathe, straight shank, ½ to 1⅛ in.
2. Engine lathe, right hand shank, ½ by 1⅛ in.
3. Engine lathe, left hand shank, ½ to 1⅛ in.

TRUCK, APPLIANCE — Complete 2 wheel type with 15 ft. strap and ratchet

UNDERCUTTER — Mica, 110 v., a.c. motor

VISE — Combination pipe and machinist 4½ in. jaws, pipe capacity ⅛ to 3½ in.

WELDING OUTFIT — Any standard make with Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 11 tips, hose and cutting attachments

BENDER, TUBE
1. External, ¼, 5/16, ⅜, 7/16, ½, and ⅝ in.
2. Internal, ⅜, ½, and ⅝ in.
3. Hand tube, mechanical, 3/16, ¼, 5/16, ⅜, ½, ⅝, and ¾ in.

BRUSHES, FITTING — ¼, ⅜, ½, ⅝, ⅞, 1⅛, 1⅜, 1⅝, and 2⅛ in. O.D. tubes

CHARGING LINE
1. Jumper end, 24, 30, and 36 in.
2. Quick coupler end, 24, and 36 in.

CLEANER, TUBE END — ½, ⅝, ⅞, and 1⅛ in. O.D. tubes

CUTTER, TUBE — ⅛ to 1¼ in., ⅞ to 2¼ in.

DETECTOR, HALIDADE LEAK

DRILLS, TWIST — High speed 1/64 to ½ in.

FLARING TOOL — Yoke and die, 3/16 to ½ in. tubing, ¼ to ⅝ in. tubing, ¾ to 1 in. tubing

GAUGES
1. Ammonia, 30 in., 150 lb., 30 in., 300 lb.
2. Retard, 30 in., 5 lb. retard to 200 lb.
3. Compound, 30 in., 150 lbs. with freon 12, 30 in., 60 lb. with: freon 12, sulphur dioxide, 0 to 300 lb., methyl chloride, carrene

GAUGE TESTER — ⅛ in. pipe threads

GOGGLES
1. Welding
2. Grinding

GUNS
1. Air
2. Cleaning

HAMMERS — Ball peen, 2 oz., 8 oz., ¾ lb., and 1 lb.

LIGHTER, TORCH — Friction type

OILER
1. Pistol, 6 oz., 13 in. spout
2. Pump, 1 pt., 15 in. spout

PINCH-OFF — ¼, 5/16, ⅜, and ½ in.

PLIERS
1. Side cutting, 5 and 6 in.
2. Diagonal cutting, 7 in.
3. Long nose, 6 in.
4. Thin nose, 6 in.
5. Pump, 5 slip adjustment
6. Eyelet, and grommet
7. Needle nose, 6 in.
8. Bent nose, 6 in.

PULLER
1. Wheel, 2 arm, 3 arm
2. Fly wheel, chain type
3. Seal ring
4. Oil ring

PUMP, TEMPERATURE AND PRESSURE — 50 lb. P., and 28 lb. vacuum

PUNCHES — Hollow, ¼, 5/16, ⅜, 7/16, ½, and ⅝ in.

REAMER, INNER-OUTER — 3/16 to 1½ in.
3/32 in. 5/64 in. 5/16 in.

REFACERS, SAE — Capacity ¼, 5/16, ⅜, ½, and ⅝ in.

SAWS
1. Hole, ⅞, 1⅛, 1½, 1¾, and 2¼ in.
2. Hack, 8 to 12 in.
3. Utility, 6 in.

SCREWDRIVERS
1. ⅛ in. blade thickness, 2, and 3 in.
2. 3/16 in. blade thickness, 1½, 3, 4, and 6 in.
3. ¼ in. blade thickness, 2, 4, 6, and 8 in.
4. 5/16 in. blade thickness, 8 in.
5. ⅜ in. blade thickness, 6 in., and 8 in.
6. Phillips, Nos. 2 to 4, and 5 to 9
7. Square, ¼ in. blade by 3 5/16 in., 5/16 in. blade by 3 5/16 in.

SNIPS
1. Straight 7, 10, and 12 in.
2. Circular 7, 10, and 12 in.

SOCKETS
1. Packing gland, ¼ in. drive Prong

Depth	Width	Diameter Inside
3/32 in.	⅛ in.	21/64 in.
⅛ in.	⅛ in.	29/64 in.
3/32 in.	5/64 in.	9/16 in.
3/32 in.	7/64 in.	5/16 in.
3/32 in.	5/64 in.	11/32 in.
3/32 in.	⅛ in.	21/64 in.

2. Valve packing nut, oval opening ½ by ⅜ in.
3. Deep and standard — midget, ¼ in. drive, 3/16, 7/32, ¼, 9/32, 5/16, 11/32, ⅜, 7/16, and ½ in., including extensions, handles, universals, and ratchet plugs
   Ferret — ¼ in. drive, ⅜, 7/16, ½, 17/32, 9/16, 19/32, ⅝, 11/16, ¾, 13/16, and ⅞ in. including extensions, handles, universals, and ratchet plugs
   Master — ½ in. drive, double hexagon, ⅜, 7/16, ½, 9/16, 19/32, ⅝, 11/16, ¾, 25/32, 13/16, ⅞, 15/16, 29/32, 1 1/16, 1 1/8, 1 3/16, and 1¼ in. including extensions, handles and universals
   Heavy duty — ¾ in. drive, 1 1/16, 1 1/8, 1¼, 1 3/8, 1 7/16, 1½, 1⅝, 1¾, 1 13/16, and 1⅞ in. including handles and extensions
4. Valve stem — 3/16, 7/32, ¼, 5/16, and ⅜ in., ¼ by 5/16 in., ¼ by 7/32 in.

SWEDGE TOOLS — ¼, 5/16, ⅜, ½, ⅝, and ¾ in.

TACKER, GASKET

TESTERS
1. Control
2. Hermetic
3. Sling psychrometer
4. Thermometer — wall, pocket, remote dial thermometer
5. Moisture indicator — freon and methyl
6. Circuit, 90 v., d.c., 60 v., a.c., 500 v. a.c./d.c.

VALVE KIT — Service set for hermetically sealed units

VISE SAWING — 3/16 to 4 in. capacity

VOLTMETER — 65 volts, 660 volts, a.c. and d.c.

WRENCHES — Open end
1. Ignition type, 7/32 to 15/64 in., ¼ to 9/32 in., 17/64 to 19/64 in., 5/16 to 11/32 in., and ⅜ to 7/16 in.
2. Short open end, 3/16 to 7/32 in., ¼ to 5/16 in., 5/16 to 11/32 in., ⅜ to 7/16 in., and ½ to 9/16 in.
3. Tappet type, 7/16 to ½ in., ½ to 9/16 in., and ⅝ to 11/16 in.
4. Heavy duty, ⅜ to 7/16 in., 7/16 to ½ in., ½ to 9/16 in., 9/16 to ⅝ in., 19/32 to 11/16 in., ⅝ to 13/16 in., ⅝ to ¾ in., ¾ to ⅞ in., 25/32 to 13/16 in., and 15/16 to 1 in.

WRENCHES — Box
1. Double Broached, ⅜ in. to 7/16 in., ½ to 9/16 in., 19/32 to 11/16 in., ⅝ to ¾ in., 25/32 to 13/16 in., ⅞ to 15/16 in., 1 to 1⅛ in., 1 1/16 to 1¼ in.
2. Double Hex., 5/16 to ⅜ in., ⅜ to 7/16 in., 7/16 to ½ in., ½ to 9/16 in., 9/16 to ⅝ in., ⅝ to ¾ in., 11/16 to 13/16 in.
3. Half Moon, 7/16 to ½ in., 9/16 to ⅝ in., ⅝ to ¾ in.
4. Vise grip, 7 and 10 in.
5. Welding tank
6. Pipe, 6, 8, 10, 14, 18, and 24 in.
7. Flare nut, ¾ by 1 in., ⅞ by 1⅛ in.
8. Refrigerator ratchet, reversible or non-reversible ½ in., 3/16, and ¼ in.
9. Adjustable 4, 6, 8, 10, 12, 18, and 24 in. Bristol, No. 4 to ½ in. Allen, 3/16 to ½ in.

Refrigeration — Supplies

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BELTS, VEE — Variety of sizes to service refrigeration units

CAPS, PLUG

CARBON TETRACHLORIDE — 1 gal. to 5 gal.

CLOTH, EMERY — 50 yd. rolls 1 in. No. 80 coarse, No. 100 medium, No. 150 fine

COMPOUND, LAPPING — 320 grit — 500 grit

CORD, RUBBER COVERED
1. 2 conductor
2. 3 conductor

DEHYDRANT — 1 oz. to 1 pt. containers

FILLERS, PLASTIC

FITTINGS
1. Couplers, compression, female ¼ in. SAE
2. Compression nut, tube size: .078–.086 in. O.D., .086 to .096 in. O.D., .096 to 109 in. O.D., .110 to .118 in. O.D.
3. Capillary tube, Male SAE, ¼, 5/16, ⅜, ½, ⅝ in.

(Continued from page 80A)

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COTTONS
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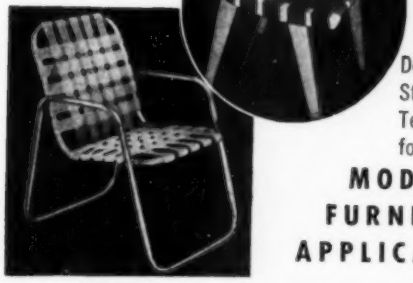
FOR INTERIORS
OR TERRACES



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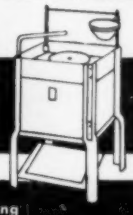

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(Continued from page 78A)

4. Ammonia
   90° elbows, 2000 lb. working pressure: ⅛, ¼, ⅜, ½, ¾, 1, 1¼, 1½, 2, and 2½ in.
   Tees, 2000 lb. working pressure: ⅛, ¼, ⅜, ½, ¾, 1, 1¼, 1½, 2, and 2½ in.
   Couplings, 3000 lb. working pressure, ⅛, ¼, ⅜, ½, ¾, 1, 1¼, 1½, 2, and 2½ in.
   Reducing couplings, ¼ by ⅛ in., ⅜ by ¼ in., ½ by ⅜ in., ¾ by ½ in., 1 by ¾ in., 1¼ by 1 in., 1½ by 1¼ in., 2 by 1½ in.
   Straight flange unions, oval: ⅜, ½, ¾, and 1 in., square: 1¼, 1½, and 2 in.
   Steel tongue and groove: ¼, ⅜, ½, and ¾ in.
   Flanged adaptors, male I.P.S., ¼ by 1½ in., ¼ by 1⅝ in., ¼ by 1¾ in., ¼ by 1⅞ in., ¼ by 2 in.
   Flanged adaptors, female I.P.S., ¼ by 1½ in., ¼ by 1⅝ in., ¼ by 1¾ in., ¼ by 1⅞ in., ¼ by 2 in.
5. Refrigerant drum adaptors, ¾ in. FPT by ¼ in. flare, ¾ in. FPT by ⅛ in. flare, ½ in. FPT by ¼ in. flare
6. Flare seal bonnet, ¼, ⅜, ½, ⅝, ¾ in.
7. Fusible metal plugs, 150°–162° F. melting, ⅛, ¼, and ⅜ in. male pipe
8. Strainer union, 150 mesh, ¼ by ⅝ in., ¼ by ¼ in.
9. S.A.E. flared fittings — coupling nuts, reducing nuts, caps, plugs, union couplings, half union couplings, female couplings, pipe plugs, reducing couplings, fitting reducer, swivel nut valve connector, bushings, union elbows, half-union elbow, female elbow, valve connectors, extra heavy half union, brass tee, reducing tee, M.P.T. on run tee
10. Wrought copper fittings: elbows, 90°, straight, 90°, reducing, 45°, straight, 90°–45° street elbows
    Tees, wrought, reducing
    Reducing couplings
    Return bends
    Unions
    Reducing bushings
    Adaptors

FLUX
1. Brazing
2. Cast iron
3. Aluminum
4. Soldering

FUSES
1. Clear windows, 6, 8, 10, 15, 20, and 30 amps.
2. Cartridge, 6, 8, 10, 15, 20, 25, and 30 amps.

GASKETS
1. Inner, door seal, ½ in. dia. by ¾ in. flange
2. Rubberized fabric, 3/16, ¼, 5/16, ⅜, ½, and ⅝ in. cushion diameter; ¼, 5/16, ⅜, ½, 9/16, and ⅝ in. flange
3. Grease proofed, ¼, 5/16, ⅜, and ½ in. cushion diameter
4. Alloy metal, .006, .010, and .015 in. thickness
5. Asbestos, 1/64, 1/32, and 1/16 in. thickness, 24 by 36 in. sheets
6. Flare gaskets, copper, ¼, ⅜, ½, ⅝, and ¾ in. I.D.

HOSE, PURGING — ¼ in. I.D. to ½ in. O.D., 50 ft. lengths

JOINT COMPOUND

KEYS, WOODRUFF — ⅝ by ⅛ in., ½ by ⅛ in., 1½ by ¼ in.

LAPPING PAPER — No. 320 fine, No. 400 very fine, No. 600 finest

LEAK DETECTOR — 2 oz. to 1 gallon containers

OIL
1. Graphite penetrating
2. Thread cutting
3. Compressor

OXYGEN

REFRIGERANTS
1. Sulphur dioxide, 25, 100, 150 lb. tanks
2. Methyl chloride, 15, 60, 100, and 140 lb. tanks
3. Freon, F12, 25, and 145 lb. tanks
4. Freon, F22, 22, and 125 lb. tanks
5. Freon, F114, 145 lb. tanks
6. Methylene chloride, 1 qt. to 5 gal.

ROD, WELDING
1. Steel, ⅛ in. diameter
2. Bronze, ⅛ in. diameter

SCREWS, ALLEN SET — No. 10 by 3/16 in., ¼ by ¼ in., 5/16 by 5/16 in., ⅜ by ⅜ in., 7/16 by 7/16 in., ½ by ½ in.

SEALING COMPOUND — Insoluble in refrigeration gases

SILICA GEL — 18–20 mesh for liquid line, 6–12 mesh for suction line

SOLDER
1. 50–50
2. Silver
3. 95–5

STEEL, WOOL — No. 0, fine, No. 1, Standard

STRAP, PERFORATED BRASS — ½ to ¾ in. wide

TAGS, IDENTIFICATION

TAPE
1. Friction, ¾ in.
2. Rubber, ¾ in.

TUBING
1. Copper capillary, .031, .040, .050 in., I.D.; .091, .110, .120 in., O.D.
2. Soft copper, 50 ft. rolls, ⅛ in. O.D., .030 in. wall thickness; 3/16 in. O.D., .030 wall thickness; ¼ in. O.D., .030 in. wall thickness; 5/16 in. O.D.; .032 wall thickness; ⅜ in. O.D., .032 wall thickness; ½ in. O.D., .032 in. wall thickness; ⅝ in. O.D., .035 in. wall thickness; ¾ in. O.D., .035 in. wall thickness
3. Hard copper, 20 ft. lengths, ¼ in. O.D., .025 in. wall thickness; ⅜ in. O.D., .030 in. wall thickness; ½ in. O.D., .035 in. wall thickness; ⅝ in. O.D., .040 in. wall thickness; ¾ in. O.D., .042 in. wall thickness; ⅞ in. O.D., .045 in. wall thickness; 1⅛ in. O.D., .050 in. wall thickness; 1⅜ in. O.D., .055 in. wall thickness; 1⅝ in. O.D., .060 in. wall thickness
4. Sponge insulation, ¼ in. I.D., ¾ in. O.D.; ⅜ in. I.D., ¾ in. O.D.; ⅜ in. I.D., 1 in. O.D.; ½ in. I.D., 1 in. O.D.; ⅝ in. I.D., 1 in. O.D.; ¾ in. I.D., 1¼ in. O.D.
5. Dehydrated copper, 3/16 in. O.D., .030 in. wall thickness; ¼ in. O.D., .030 in. wall thickness; 5/16 in. O.D., .030 in. wall thickness; ⅜ in. O.D., .032 in. wall thickness; ½ in. O.D., .032 in. wall thickness; ⅝ in. O.D., .035 in. wall thickness; ¾ in. O.D., .035 in. wall thickness
6. Sponge rubber, ¼ in. I.D., ¾ in. O.D.; ⅜ in. I.D., ¾ in. O.D.; ⅜ in. I.D., 1 in. O.D.; ½ in. I.D., 1 in. O.D.; ⅝ in. I.D., 1 in. O.D.; ¾ in. I.D., 1¼ in. O.D.

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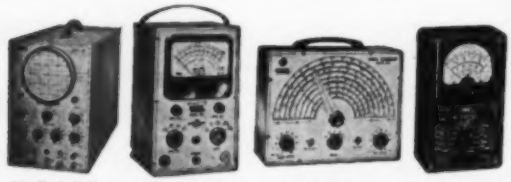

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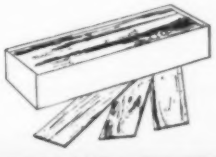

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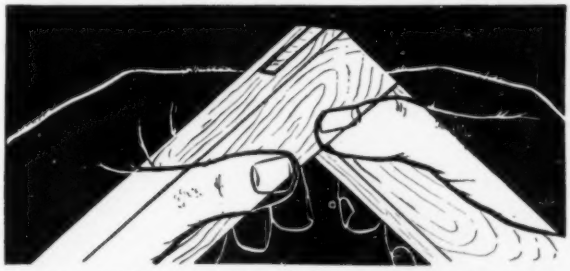

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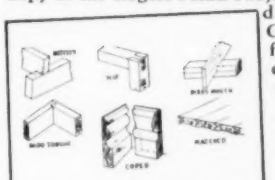

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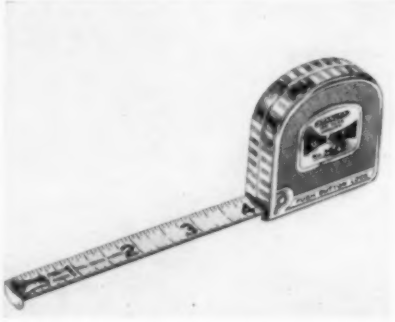
Shop Equipment News

GLIDE-O-MATIC STEEL TAPE RULE

Stanley Tools, division of The Stanley Works, have introduced the new "Glide-O-Matic" steel tape rules with automatic gliding-action blade return.



Glide-O-Matic Steel Tape Rule

This tape rule for every use features: a positive push-button lock holding the tape precisely at the desired length; linear calibrations in red on back of tape for inside measurements, and hardened-steel scribers at case mouth for marking measurements easily and accurately. The elimination of the first 2 inches of graduations on bottom side of tape compensates for 2-inch case length and provides direct reading for inside measurements.

Stanley "Glide-O-Matic" tape rules in 8-, 10-, and 12-ft. lengths have exclusive oilless reel bearings for quiet, smooth operation and long life. On top side of tape, two scales, one in inches and feet, the other in continuous inches, permit readings in feet and inches or inches alone. Tape will not detach in normal use and is easily replaced without taking the die-cast chrome-plated case apart.

Each Glide-O-Matic rule is individually packed in free plastic box with magnifying lens in cover.

Additional information available.

(For further details encircle index code 0301)

NEW STARRETT NO. 436 MICROMETER

The L. S. Starrett Company are offering a new outside micrometer caliper of one-inch capacity that combines strength, rigidity, and lightness with fine precision features.

The frame of the No. 436 Series Outside Micrometer Caliper is specially forged and ribbed for extra strength and tapers to the anvil to permit use in narrow slots and tight places. Finish on the frame is smooth black enamel, for easy cleanup while the thimble and sleeve have a hard, long-wearing, multi-plate Satin Chrome Finish that eliminates glare, resists rust and stains.

Anvil and spindle faces are hi-micro-lapped to a mirror finish. Also available with carbide faces.

The spindle is made as one piece for extra rigidity with threads hardened, stabilized, and ground from the solid. The large diameter thimble and sleeve have easy-to-read, distinct black figures and graduations against Satin Chrome Finish with every graduation numbered for quick reading and positive identification. Decimal equivalents of 8ths, 16ths, and 64ths are conveniently placed on the thimble.

New Starrett No. 436 Micrometer

The new No. 436 one-inch micrometer is furnished with or without a lock nut which makes it possible to lock the micrometer at any setting. It also is available at additional cost with a ratchet stop at the end of the thimble or with a friction control built into the thimble.

No. 436 Series micrometers incorporating these precision features are also available in sizes up to nine inches with solid frame and from 10 to 24 inches with perforated frame.

A catalog describing the complete line is available on request.

(For further details encircle index code 0302)

NEW CHAIN SAW ATTACHMENT

The Black & Decker Mfg. Company have announced a new Chain Saw Attachment for their No. 73 and 83 Saws. Featuring safety and ease of handling, the attachment fits easily into either portable electric saw, forming an integral unit for cutting timber, firewood, structural lumber, and stacked lumber, as well as for many other heavy cutting jobs.

The New Black & Decker Chain Saw Attachment connected to the No. 73 Heavy-Duty Saw

Maximum safety is built into the attachment, with a wide aluminum shield to fully

(Continued on page 84A)

CORRESPONDING CODE INDEX NUMBERS TO BE ENCIRCLED CAN BE FOUND ON THE CARDS IN THE READER'S SERVICE SECTION

DIRECTORY OF MANUFACTURERS' PRODUCTS

This directory is published as a convenient guide to sources of supply, covering the products of manufacturers carrying product information in this ANNUAL NUMBER. For alphabetical index of manufacturers' advertising see page 95A. To obtain products not included in this directory, quotations or additional information to help you make up your specifications, lists of equipment, etc., address Industrial-Arts Service Division, or use coupon on page 96A.

A

ABRASIVE CEMENT
American Abrasive Metals Co.

ADJUSTABLE CURVE RULERS
Alvin & Company
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Fairgate Rule Co.
Keuffel & Esser
Modern School Supplies
Post Company, Frederick
Weber Co., F.

AIR CONDITIONING EQUIPMENT
Curtis Mfg. Co.

AIR FILTERS
Logan Engineering Co.

ALUMINUM PROJECTS
Hubbell Metals, Inc.

AMMETERS
Brodhead-Garrett Co.
Electronic Instrument Co. (EICO)
Weston Electric Instrument Corp.

ANGLE PLATES
Challenge Machinery Co.
Machine Shop Project Service

ANVIL BASE
Dixon, Inc., Wm.
Stoner Wood Products Co.

ANVILS
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.

ANVIL TOOLS
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Stanley Tools

ARBOR PRESSES
Brodhead-Garrett Co.
Dake Engine Company
Dixon, Inc., Wm.
Patterson Bros.

ARC-WELDING SETS & EQUIP.
Brodhead-Garrett Co.
Delta Mfg. Co.
Marquette Mfg. Co.

ART METAL TOOLS
Brodhead-Garrett Co.
Dixon, Inc., William
Metal Crafts Supply Co.
Metal Goods Corp.
Patterson Bros.

AUTOMOTIVE TOOLS AND EQUIPMENT
Alondra Sales, Inc.
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Curtis Mfg. Co.
Duro Metal Products Co.
Snap-on Tools Corp.
Starrett Co., The L. S.
Williams Co., J. H.

AWLS, TINNERS
Brodhead-Garrett Co.
Patterson Bros.

AXES
Brodhead-Garrett Co.

B

BABBITT FURNACES
American Gas Furnace Co.
Brodhead-Garrett Co.
Patterson Bros.

BAND SAW BLADES
Boice-Crane Co.
Cocker Saw Co., Inc.
Delta Mfg. Co.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Rouse & Co., H. B.
Simmonds Saw & Steel Co.
Starrett Co., The L. S.
Walker-Turner Co., Inc.

BAND SAW BRAZERS, Electric
Boice-Crane Co.
Foley Mfg. Corp.
Oliver Machinery Co.
Walker-Turner Div.

BAND SAWS
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Cook Machinery & Supply Co.
Delta Mfg. Co.
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Parks Woodworking Mach. Co.
Patterson Bros.
Rouse & Co., H. B.
Walker-Turner Co., Inc.
Wallace & Co., J. D.
Yates-American Machine Co.

BAND SAWS, METALCUTTING
Boice-Crane Co.
Brodhead-Garrett Co.
Duro Metal Products Co.
Kalamazoo Tank & Silo Co.
Oliver Machinery Co.
Patterson Bros.
Rouse & Co., H. B.
Walker-Turner Div.
Wallace & Co., J. D.

BAND SAWS, PORTABLE
Brodhead-Garrett Co.
Delta Mfg. Co.
Patterson Bros.
Walker-Turner Co., Inc.

BAND SAW SETS
Brodhead-Garrett Co.
Oliver Machinery Co.

BENCH FURNACES
American Gas Furnace Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Johnson Gas Appliance Co.
Patterson Bros.

BENCH-PLATES
Challenge Machinery Co.
Dixon, Inc., William
Patterson Bros.

BENCH TOPS
Hardwood Corp. of America
Patterson Bros.
Sheldon Equip. Co., E. H.

BENCHES
Jewelers' and Metal Workers'
Brodhead-Garrett Co.
Craftools, Inc.
Dixon, Inc., William
Parent Metal Products, Inc.
Patterson Bros.
Sheldon Equip. Co., E. H.

BENCHES, MANUAL TRAINING
Brodhead-Garrett Co.
Challenge Machinery Co.
Engineering Mfg. Co.
Hamilton Manufacturing Co.
Parent Metal Products, Inc.
Patterson Bros.
Sheldon Equip. Co., E. H.
South Bend Lathe Works
Standard Pressed Steel Co.
Tolerton Co.

BENCHES — WORK
Challenge Machinery Co.
Dixon, Inc., Wm.
Patterson Bros.
Sheldon Equip. Co., E. H.
Standard Pressed Steel Co.
Stoner Wood Products Co.
Tolerton Co.

BENCH VISES
Brodhead-Garrett Co.
Columbian Vise & Mfg. Co.
Dixon, Inc., William
Machine Shop Project Service
Morgan Vise Co.
Patterson Bros.
Parent Metal Products, Inc.
Sheldon Equip. Co., E. H.
Stanley Tools
Tolerton Co.

BENDERS, METALWORKING
Dixon, Inc., William
Hossfeld Mfg. Co.
O'Neil-Irwin Mfg. Co.
Patterson Bros.

BINDERY EQUIPMENT & SUPPLIES
Black & Decker Mfg. Co.
Challenge Machinery Co.
Pratt Co., G. A.

BIT HOLDERS, EXTENSION
Brodhead-Garrett Co.
Greenlee Tool Co.
Patterson Bros.
Stanley Tools

BITS, Auger, Machine, Hollow Chisel, Router
Brodhead-Garrett Co.
Chicago-Latrobe
Greenlee Tool Co.
Irwin Auger Bit Co.
Patterson Bros.
Stanley Tools
Walker-Turner Div.
Whitman & Barnes
Williams Co., J. H.

BITS, SCREW DRIVERS
Brodhead-Garrett Co.
Greenlee Tool Co.
Irwin Auger Bit Co.
Patterson Bros.
Snap-on Tools Corporation
Stanley Electric Tool Div.
Stanley Tools

BLACKBOARD DRAWING SETS
Alvin & Company
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Keuffel & Esser
Modern School Supplies
Post Company, Frederick
Weber Co., F.

BLACKSMITH TOOLS AND SUPPLIES
Brodhead-Garrett Co.
Columbian Vise & Mfg. Co.
Patterson Bros.
Stanley Tools

BLOWERS, FORGE
American Gas Furnace Co.
Brodhead-Garrett Co.
Patterson Bros.

BLOWPIPES, Brazing, Jewelers'
American Gas Furnace Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.

BLUE-PRINTING MACHINES, ELECTRIC
Dietzgen Co., Eugene
P & H Sales Corp.
Post Company, Frederick

BOARDS, DRAWING
Alvin & Company
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Engineering Mfg. Co.
Fairgate Rule Co.
Hamilton Mfg. Co.
Keuffel & Esser
Modern School Supplies
Post Company, Frederick
Stacor Equipment Co.
Tolerton Co.
Weber Co., F.

BOAT KITS
Castolite Co., The
Minnesota Woodworkers Supply Co.

BOLTS, STOVE, HANGER and Carriage
Southern Screw Co.

BOOKBINDERS' SUPPLIES
Black & Decker Mfg. Co.
Higgins Ink Co., Inc.
Pratt Co., G. A.

BORERS, WOOD
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Co.
Oliver Machinery Co.
Patterson Bros.
Yates-American Machine Co.

BORING BARS
Armstrong Bros. Tools
Brodhead-Garrett Co.
Patterson Bros.
South Bend Lathe Works
William & Co., J. H.

BORING TOOLS
Armstrong Bros. Tools
Brodhead-Garrett Co.
DeWalt Products Co.
Greenlee Tool Co.
Patterson Bros.
South Bend Lathe Works
Stanley Tools
Williams & Co., J. H.

BOW COMPASSES, DIVIDERS, PENS, PENCILS
Alvin & Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Keuffel & Esser
Modern School Supplies
Post Company, Frederick
School Products Co.
V & E Mfg. Company
Weber Co., F.

BRACES
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools

BRACKETS, SAWHORSE
Dalton Mfg. Co.

BRAD AWLS
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools

BRAKES, METALWORKING
O'Neil-Irwin Mfg. Co.
Patterson Bros.
Stueck, Inc., W. Whitney

BRASS FURNACES, GAS
American Gas Furnace Co.
Brodhead-Garrett Co.
Patterson Bros.
Western Materials Co.

BRASS TYPE
Brodhead-Garrett Co.

BRAYERS
Brodhead-Garrett Co.
Dixon, Inc., William

BRAZING TORCHES
American Gas Furnace Co.
Patterson Bros.

BRISTOL BOARD
Brodhead-Garrett Co.
Keuffel & Esser
Post Company, Frederick
Weber Co., F.

BRITTANIA METAL
Metal Crafts Supply Co.
Patterson Bros.

BRUSHES, ARTISTS'
Alvin & Company
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Modern School Supplies
School Products Co.
Weber Co., F.

BRUSHES, CIRCULAR, BRISTLE AND WIRE (All Kinds)
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Craftools, Inc.
Dixon, Inc., William
Knudson, E. C.

BUFFERS, BENCH, PEDESTAL
Brodhead-Garrett Co.
Craftools, Inc.
Delta Mfg. Co.
Dixon, Inc., William
Machine Shop Project Service
Patterson Bros.
Walker-Turner Div.

BURNERS, GAS
Dixon, Inc., William

C

CABINET HARDWARE
Brodhead-Garrett Co.
Minnesota Woodworkers Supply Co.
Standard Pressed Steel Co.
Upholstery Supply Co.

CABINETS, Cuts, Furniture, Galleys, Inks, Type, and Rollers
Hamilton Mfg. Co.
Parent Metal Products, Inc.
Standard Pressed Steel Co.
Tolerton Co.

CALIPERS
Alvin & Company
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Dixon, Inc., William
Millers Falls Co.
Modern School Supplies
Patterson Bros.
Starrett Co., L. S.
Western Materials Co.

CARVING TOOLS for Wood and Linoleum
Brodhead-Garrett Co.
Craftools, Inc.
Patterson Bros.

CENTER LATHE
Brodhead-Garrett Co.
DeWalt Products Co.
LeBlond Machine Tool Co.
Patterson Bros.
South Bend Lathe Works
Walker-Turner Div.
Whitman & Barnes

CERAMICS, SUPPLIES
Brodhead-Garrett Co.
Craftools, Inc.
Electric Hotpack Co., Inc.
School Products Co.
Soeley's Ceramic Studio
Thompson Corp., Geo. S.
Tolerton Co.

CHARTS
Brodhead-Garrett Co.
Starrett Co., The L. S.

CHASING TOOLS
Brodhead-Garrett Co.
Dixon, Inc., William
Metal Crafts Supply Co.

CHISELS, Cape, Cold, Grooving
Brodhead-Garrett Co.
Cincinnati Tool Co.
Delta Mfg. Co.
Duro Metal Products Co.
Patterson Bros.
Snap-on Tools Corp.
Stanley Tools
Williams Co., J. H.

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STEEL FLASKS
INGOT METAL
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CRUCIBLE TONGS
FLUX - RAMMERS
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GLOVES - APRONS
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INSTRUCTORS:
Teaching aids are available to you upon request. These include wall size drill applications chart; decimal equivalents charts . . . pocket, desk or wall size . . . and booklet on "Drill and Reamer Facts" covering design, use and care of drills and reamers.

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"Makers of Fine Tools Since 1848"
40105 PLYMOUTH ROAD
PLYMOUTH, MICHIGAN
NEW YORK • CHICAGO • LOS ANGELES

SHOP EQUIPMENT NEWS

(Continued from page 82A)

protect the hand and other parts of the body. The Black & Decker Saw itself has an instant release trigger switch which gives the operator split second on-off control.

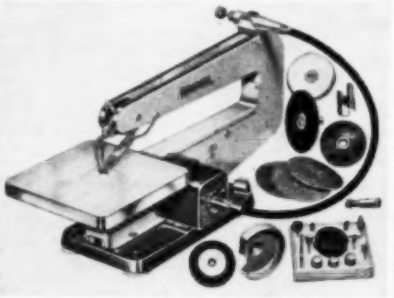
For ease of handling, the Black & Decker Chain Saw Attachment and Saw form a perfectly balanced unit. Besides the increased efficiency gained by minimizing operator fatigue on routine cutting jobs, this balance makes for easy handling in hard-to-get-at places such as overhead beams and joints.

Further information on other excellent features of this attachment, are available.

(For further details encircle index code 0303)

PORTABLE CRAFT SHOP

The Dremel Manufacturing Company have introduced a new power workshop tool, especially designed for elementary and high school classrooms.



Dremel's Portable Craft Shop

Called the Model 57 Moto-Shop, the unit is powered by a ball bearing rotary motor with a unique power take-off, to which a number of attachments can be added. From a 15-in. jig saw, it can be quickly converted into a disk sander, bench grinder, buffing tool, and a flexible shaft machine.

Weighing only 12 lb., the Moto-Shop can be set up on a small table anywhere in the classroom. A safety guard completely surrounds the blade, making it safe for even six-year-olds.

The attachements have many applications in arts and crafts work: grinding off ceramic stilt marks, polishing jewelry, engraving, routing, drilling holes in jewelry, removing fine scale from copper, drilling holes when making inside cuts with the jig saw, etc.

More information and catalog are available.

(For further details encircle index code 0304)

ARBOR-LOC SPINDLE NOSE ANNOUNCED BY CINCINNATI MILLING

A new type of spindle nose is now incorporated in 28 sizes, types and styles of Cincinnati knee-and-column milling machines employing the No. 50 series spindle nose. The new feature, known as Arbor-Loc, provides a quick and easy method of changing arbors. Dimensions and basic design of the milling machine manufacturer's standard spindle nose are retained.

The Arbor-Loc spindle nose accommodates Cincinnati's complete new line of No. 50 series standard flanged arbors and adapters. These new arbors can also be used on older

(Continued on page 86A)

CORRESPONDING CODE INDEX NUMBERS TO BE ENCIRCLED CAN BE FOUND ON THE CARDS IN THE READER'S SERVICE SECTION

PLAY IT SAFE...with the GS No. 9000 GOGGLE

No. 9000 — Clear No. 9100 — Green

FOR SHOP AND LABORATORY

This featherweight one-piece goggle fits all faces — men and women alike. Optically perfect and molded to .060" thickness, lenses are impact-resistant and afford protection for light grinding, spot welding, and other semi-hazardous operations. May be worn over prescription glasses. Handsome styling ends complaints about ugly, cumbersome goggles — everyone will want to wear them!

PRICES FOR NO. 9000 AND NO. 9100:
1 to 11 doz. $7.20 per doz. | 12 to 35 doz. $6.60 per doz. | 36 doz. or more $6.00 per doz.

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• EFFICIENT
• ECONOMICAL

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Brodhead-Garrett Co.
Greenlee Tool Co.
Patterson Bros.
Stanley Tools

CHISELS, Metal Cutting and Wood Carving
Brodhead-Garrett Co.
Cincinnati Tool Co.
Dixon, Inc., William
Duro Metal Products Co.
Greenlee Tool Co.
Patterson Bros.
Williams Co., J. H.

CHUCKS, COMBINATION
Atlas Press Co.
Brodhead-Garrett Co.
South Bend Lathe Works

CHUCKS, DRILL
Brodhead-Garrett Co.
Chicago-Latrobe
Cincinnati Lathe & Tool Co.
DeWalt Products Corp.
Dixon, Inc., William
North Bros. Mfg. Co.
Patterson Bros.
Stanley Electric Tools
Whitman & Barnes

CHUCKS, INDEPENDENT, Universal Combination
Brodhead-Garrett Co.
Boice-Crane Company
Patterson Bros.
South Bend Lathe Works

CIRCULAR-SAW BENCHES
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Shopmaster, Inc.
Walker-Turner Co., Inc.
Yates-American Machine Co.

CIRCULAR SAWS
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Cocker Saw Co., Inc.
Columbia Machinery & Supply Co.
Curtis Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Patterson Bros.
Walker-Turner Div.
Wallace & Co., J. D.

CLAMPS, ADJUSTABLE, BAR
Adjustable Clamp Co.
Armstrong Bros. Tool Co.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Minnesota Woodworkers Supply Co.
Patterson Bros.
Starrett Co., L. S.
Williams Co., J. H.

CLAMPS, CARRIAGE, SCREW, WELDERS
Adjustable Clamp Co.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Machine Shop Project Service
Patterson Bros.
Williams Co., J. H.
Wilton Tool Mfg. Co., Inc.

CLEANERS, FILE
Cincinnati Tool Co.
Dixon, Inc., Wm.
Knudson, E. C.

COMBINATION SQUARES
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Fairgate Rule Co.
Patterson Bros.
Stanley Tools
Starrett Co., The L. S.

COMPOSING STICKS
Rouse & Co., H. B.

CONTROLLERS, ELECTRIC
Electric Hotpack Co., Inc.
Weston Electric Instrument Co.

COPING SAW BLADES
Brodhead-Garrett Co.
Delta Mfg. Co.
Dixon, Inc., William
Patterson Bros.

COPING SAWS
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.

COPPER NOVELTIES
Copper Shops
School Products Co.

CORD, FURNITURE
Webcraft, Inc.

COUNTERSINKS
Brodhead-Garrett Co.
Chicago-Latrobe
Greenlee Tool Co.
Patterson Bros.
Stanley Tools
Whitman & Barnes

CURVES, IRREGULAR
Alvin & Company
Brodhead-Garrett Co.
Dietzgen Co., Eugene
DeWalt Products Corp.
Duro Metal Products Co.
Engineering Sales Company
Keuffel & Esser
Modern School Supplies
Post Company, Frederick
Weber Company, F.

CUT-OFF SAWS
Boice-Crane Co.
Brodhead-Garrett Co.
Cocker Saw Co., Inc.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Oliver Machinery Co.
Wallace & Co., J. D.
Yates-American Machine Co.

CUTTER HEADS
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Patterson Bros.
Yates-American Machine Co.

CUTTER & TOOL GRINDERS
Boice-Crane Co.
Brodhead-Garrett Co.,
Brown & Sharpe Mfg. Co.
LeBlond Machine and Tool Co., R. K.
Patterson Bros.

CYLINDER PRINTING PRESS
Challenge Machinery Co.

D

DADO HEADS
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Cocker Saw Co., Inc.
Curtis Mfg. Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Walker-Turner Co., Inc.
Yates-American Machine Co.

DESKS, Instructors'
Parent Metal Products, Inc.

DIVIDING HEAD
U. S. Burke Machine Tool Div.

DO IT YOURSELF PROJECTS
Machine Shop Project Service
School Products Co.
Stueck, Inc., W. Whitney

DOWEL POINTERS
Brodhead-Garrett Co.
Patterson Bros.

DOWELING JIGS
Brodhead-Garrett Co.
Dowl-It Co.
Patterson Bros.
Stanley Tools

DRAFTING MACHINES
Alvin & Company
Modern School Supplies
Universal Drafting Machine Corp.

DRAFTING PAPER
Alvin & Company
General Finishes Sales & Service Co.
Modern School Supplies
School Products Co.

DRAFTING PENS
Alvin & Company
Berger Scientific Supplies, Inc.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Keuffel & Esser
Modern School Supplies
Post Company, Frederick
V & E Mfg. Company
Weber Co., F.

DRAFTING TABLES
Alvin & Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Engineering Mfg. Co.
Hamilton Mfg. Co.
Keuffel & Esser
Modern School Supplies
Parent Metal Products, Inc.
Post Company, Frederick
Sheldon Equip Co., E. H.
Stacor Equipment Co.
Standard Pressed Steel Co.
Stoner Wood Products Co.
Tolerton Co.
Weber Company, F.

DRAFTSMEN'S INSTRUMENTS
Alvin & Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Fairgate Rule Co.
Keuffel & Esser
Modern School Supplies
Post Company, Frederick
School Products Co.
V & E Mfg. Company
Weber Company, F.

DRAWING INSTRUMENTS REPAIR PARTS
Alvin & Company
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Engineering Mfg. Co.
Modern School Supplies
Post Co. Frederick
V & E Mfg. Company
Weber Co., F.

DRAWING OUTFITS
Alvin & Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Engineering Mfg. Co.
Keuffel & Esser
Modern School Supplies
Post Company, Frederick
V & E Mfg. Company
Weber Co., F.

DRAWING PAPER IN ROLLS AND SHEETS
Alvin & Company
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Keuffel & Esser
Modern School Supplies
Post Company, Frederick
School Products Co.
Weber Co., F.

DRILL PRESSES
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Columbia Machinery & Supply Co.
Delta Mfg. Co.
Duro Metal Products Co.
Patterson Bros.
South Bend Lathe Works

DRILL SHARPENERS
Atlas Press Co.
Brodhead-Garrett Co.
Patterson Bros.
Snap-on Tools, Corp.

DRILL STANDS, BENCH, POST, PEDESTAL
Black & Decker Mfg. Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Duro Metal Products Co.
Patterson Bros.
Snap-on Tools, Corp.
South Bend Lathe Works
Stanley Electric Tools
Whitman & Barnes

DRILLING MACHINES, PORTABLE ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Patterson Bros.
Snap-on Tools, Corp.
Stanley Electric Tools

DRILLING MACHINES, RADIAL
Boice-Crane Co.
Walker-Turner Div.

DRILLS
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Chicago-Latrobe
Dowl-It Co.
Patterson Bros.
Snap-on Tools, Corp.
Stanley Electric Tool Div.
Whitman & Barnes

DRILLS, BENCH AND FLOOR, HIGH SPEED
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
Duro Metal Products Co.
Patterson Bros.
South Bend Lathe Works
Walker-Turner Co.

DRILLS, BREAST
Brodhead-Garrett Co.
Patterson Bros.
Snap-On Tools Corp.
Stanley Tools

DRILLS, CARVING FOR PLASTICS
Brodhead-Garrett Co.
Patterson Bros.

DRILLS, HAND
Dixon, Inc., William
Patterson Bros.
Snap-on Tools, Inc.
Stanley Tools

DUPLICATORS, MIMEOGRAPH
Dick Company, A. B.

DUST COLLECTORS
Craftools, Inc.
Patterson Bros.
School Products Co.

DYNAMOMETERS, ELECTRIC
Brodhead-Garrett Co.

E

ELECTRIC WELDING EQUIPMENT & SUPPLIES
Brodhead-Garrett Co.
Delta Mfg. Co.
Marquette Mfg. Co.
Standard Pressed Steel Co.

ELECTRIC EQUIPMENT, WIRE & SUPPLIES
Brodhead-Garrett Co.
Gearon Company, The
Kassel & Co., L. H.
Ohmite Mfg. Co.

ELECTRIC GENERATORS
Standard Electric Time Co.

ELECTRIC MOTORS
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Dixon, Inc., Wm.
Patterson Bros.

ELECTRIC SOLDERING IRONS
Brodhead-Garrett Co.
Dixon, Inc., William
Handcrafters, The
Patterson Bros.
Snap-on Tools, Inc.
Stanley Tools

ELECTRICAL INSTRUMENTS
Brodhead-Garrett Co.
Electronic Instrument Co. (EICO)
Weston Electric Instrument Co.

ELECTRICITY — Experimental Kits for Teaching
National Wiring Bureau

ELECTROTYPES
Badger-American Electrotype Co.

ENAMELING ON COPPER SUPPLIES
Copper Shop
Craftools, Inc.
Dixon, Inc., William
Metal Findings Corp.
School Products Co.

ENGRAVERS' TOOLS AND SUPPLIES
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SHOP EQUIPMENT NEWS

(Continued from page 84A)

Arbor-Loc Spindle Nose

machines without the Arbor-Loc feature. Special purpose quick change accessories are not required.

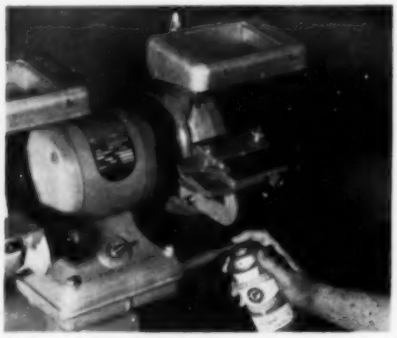
Arbor-Loc can be dismantled within a minute's time when desired to mount face milling cutters on the spindle nose. The conventional draw-in bolt is also supplied for tooling setups which require it.

Additional information may be obtained from The Cincinnati Milling Machine Company. Ask for their catalog No. M-2016.

(For further details encircle index code 0305)

NEW PUSH-BUTTON SPRAY UNIT

Rockwell Manufacturing Company offers a new push-button spray for retouching surfaces of all Delta and Walker-Turner industrial power tools.



New Push-Button Spray Unit

Spray and container weigh 12 ounces. The spray is high-quality gray enamel color-blended to match the finish of both Delta and Walker-Turner industrial tools. It is designed primarily for covering scrapes, nicks, scratches, chips and spots, and for prevention of rust on exposed surfaces.

(For further details encircle index code 0306)

(Continued on page 88A)

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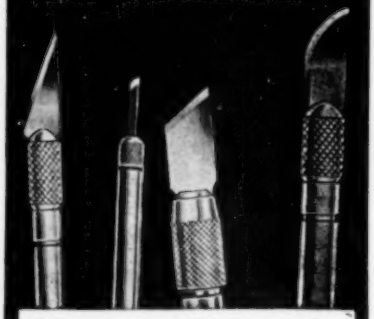

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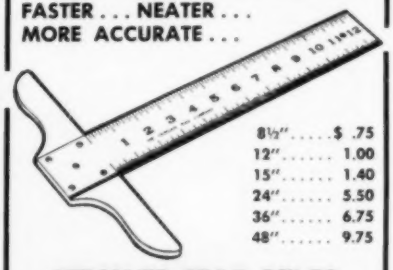

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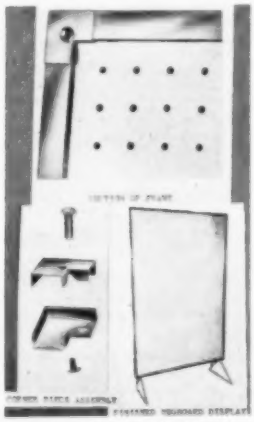
SHOP EQUIPMENT NEWS

(Continued from page 86A)

"LINEDGE" PREFABRICATED FRAMING MATERIALS

Fairgate Rule Company are now marketing new pre-formed framing edges, corners, and leg stands for displays. The frames are supplied in lengths of 6, 8, and 12 feet, and may be cut with a hacksaw in a few seconds, since they are prefabricated in an extruded shape out of nonrusting aluminum. Right angle corner pieces are quickly screwed at the corners *with a screwdriver or a dime*. The leg stands are sturdy triangular iron pieces which are also attached by means of screws. Hanging brackets are also furnished for attaching display to the wall. All items are furnished in satin smooth finish in blue, gold, or silver.



New Pre-Formed Framing Materials

These items quickly convert a sheet of pegboard, masonite, plywood, celotex, wallboard, corkboard, etc., into a finished, attractive display stand.

They also are being used for retail store displays, exposition booths, conventions, chain stores, schools, hotels, clubs, and camps. The displays are easily dismantled and reassembled for shipment from show to show.

Complete literature and information are available.

(For further details encircle index code 0307)

MARK II POCKET-SIZE LEAD HOLDER

Alvin & Company have introduced their Mark II Pocket-Size Lead Holder. It offers "double-duty" convenience, is handy for all phases of sketching and layout work, as well as for light-duty marking and checking. The

Mark II Pocket-Size lead Holder

lead holder is 5 in. long, fits into a pocket ready for instant use. Smartly styled with nickel spring pocket clip, the Mark II is de-

(Continued on page 90A)

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by **Dewitt Hunt**

Professor and Head of the School of Industrial Arts Education, Oklahoma A. & M. College

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Williams & Co., J. H.

MILLING MACHINES
Atlas Press Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Cincinnati Lathe & Tool Co.
Cincinnati Milling Mach. Co.
Kearney & Trecker Corp.
Logan Engineering Co.
Patterson Bros.
Rouse & Co., H. B.
Sheldon Machine Co., Inc.
U. S. Burke Machine Tool Div.

MILLING MACHINE VISES
U. S. Burke Machine Tool Div.
Wilton Tool Mfg. Co., Inc.

MITER BOXES
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools

MITERING MACHINES, HAND AND POWER (Printing)
Brodhead-Garrett Co.
DeWalt Products Corp.
Patterson Bros.
Rouse Co., H. B.

MODELING TOOLS
Brodhead-Garrett Co.
Craftools, Inc.
Dixon, Inc., William
School Products Co.

MORTISERS
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Greenlee Tool Co.
Oliver Machinery Co.
Patterson Bros.
Powermatic Machine Co.
South Bend Lathe Works
Walker-Turner Co., The
Yates-American Machine Co.

MOSAIC SUPPLIES
Modern Mosaics

MOTOR GENERATOR SETS
Brodhead-Garrett Co.

MOTORS, ELECTRIC
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
Dixon, Inc., Wm.
Heston & Anderson
Patterson Bros.
Stanley Electric Tool Div.

N

NIPPERS, Cutting, Jewelers'
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Starrett Co., L. S.

NOTCHERS
O'Neill Irwin Mfg. Co.

NUTS, MACHINE SCREW
Southern Screw Co.

O

OHMMETERS, PORTABLE
Brodhead-Garrett Co.
Electronic Instrument Co. (EICO)
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OILSTONE TOOL GRINDER, Power
Brodhead-Garrett Co.
Dixon, Inc., Wm.
Mummert-Dixon Co.
Oliver Machinery Co.
Patterson Bros.

OVEN, PLASTIC PREHEATING
Electric Hotpack Co., Inc.

OZALID PAPER
Dietzgen Co., Eugene

P

PAGE FRAMES
Rouse Co., H. B.

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Wisconsin Laboratories, Inc.

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PLANES, HAND
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Stanley Tools

PLANES, PORTABLE, ELECTRIC
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Stanley Electric Tool Div.

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Duro Metal Products Co.
Lufkin Rule Co.
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Plastic Parts & Sales
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Starrett Co., The L. S.
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Patterson Bros.
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Weston Electric Instrument Co.

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Electric Hotpack Co., Inc.
School Products Co.

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Rouse Co., H. B.

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PROJECTORS
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Modern School Supplies
Patterson Bros.
Post Company, Frederick
Starrett Co., The L. S.

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Dixon, Inc., William
Machine Shop Project Service
Patterson Bros.
Snap-on Tools Corp.
Starrett Co., The L. S.

PUNCH PRESSES
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Sales Service Machine Tool Co.

R

RADIAL SAWS
Walker-Turner Div.
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SHOP EQUIPMENT NEWS

(Continued from page 88A)

signed to hold extra thick 3mm. colored refill leads in the most popular choice of colors.

The holder is extremely lightweight and well balanced with its knurled nickel finger grip and hexagonal tapering for sure-grip hold.

The durable jet black, hard rubber barrel contains a noncorrosive propelling coil spring ejector — instant push-button lead adjustment is a one-hand operation. Firm gripping clutch mechanism holds lead securely, will not shear.

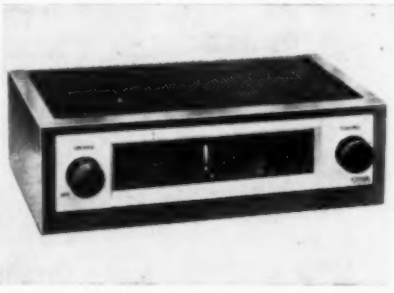
Brightly colored top button matches refill leads. Mark II Lead Holders are available in red, blue, green, yellow, violet, orange, black, and brown.

Further information is available.

(For further details encircle index code 0308)

EICO ANNOUNCES NEW FM TUNER

The pre-wired, pre-aligned, drift-free *Front End* in the new Electronic Instrument Company, HFT 90 FM Tuner makes it completely practical even for the novice to build a really good professional FM Tuner. Exact center-of-channel tuning is provided by EICO's precision "eyetronic" traveling neon indicator. Excellent reception assured even in fringe areas.



New FM Tuner

Other performance features include flywheel tuning, automatic gain control, stabilized low limiting threshold for excellent performance from weaker signals, broad-hand ratio detector for improved capture ratio and easier tuning, full-wave rectifier and heavy filtering, and very low distortion plus flat frequency response for superb audio quality.

(Continued on page 92A)

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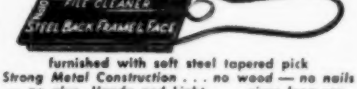

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Dietzgen Co., Eugene
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Misener Mfg. Co.

SAWS, METALCUTTING
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Snap-on Tools Corp.
Stanley Tools
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Dietzgen Co., Eugene
Keuffel & Esser
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Post Company, Frederick
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Standard Pressed Steel Co.
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Snap-on Tools Corp.
Starrett Co., The L. S.

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Dixon, Inc., William
Patterson Bros.
Rouse & Co., H. B.
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Standard Electric Time Co.
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South Bend Lathe Works
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SHOP EQUIPMENT NEWS

(Continued from page 90A)

Newly designed low-silhouette construction, utilizing horizontal chassis to permit proper layout and component separation necessary for long component life and stability. Important construction aids include simplified dial cord arrangement and pre-wired tuning eye assembly. Extremely flexible design permits easy console installation with adaptability to different thicknesses of panel. Optional cabinet may also be used in console installation to provide additional shielding.

Further data are available.

(For further details encircle index code 0309)

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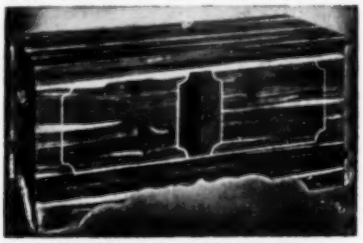

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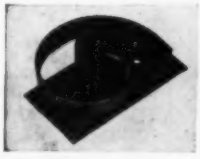

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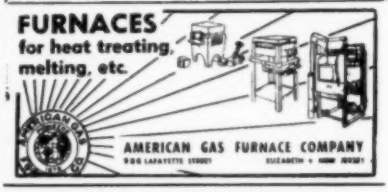

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38	319	329	339	349	359	369	379	389	399	3109	3119	3129	3139	3149	3159	
39	320	330	340	350	360	370	380	390	3100	3110	3120	3130	3140	3150	3160	
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